Fire Weather Annual Report
Southeast Idaho
2016

Pocatello Fire Weather Office
Pocatello, Idaho

DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service

2016 Fire Weather Annual Report

National Weather Service – Pocatello Fire Weather Office

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National Weather Service
Weather Forecast Office Pocatello
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Pocatello, ID 83204

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1. Introduction:

The National Weather Service, Weather Forecast Office at Pocatello, Idaho has Fire Weather Forecast responsibility for portions of Idaho serviced by the Central, Eastern and Southern Interagency Dispatch Centers (Figure 1). The Pocatello Fire Weather Office produces this Annual Fire Weather Report. Previous reports are maintained up to five years.

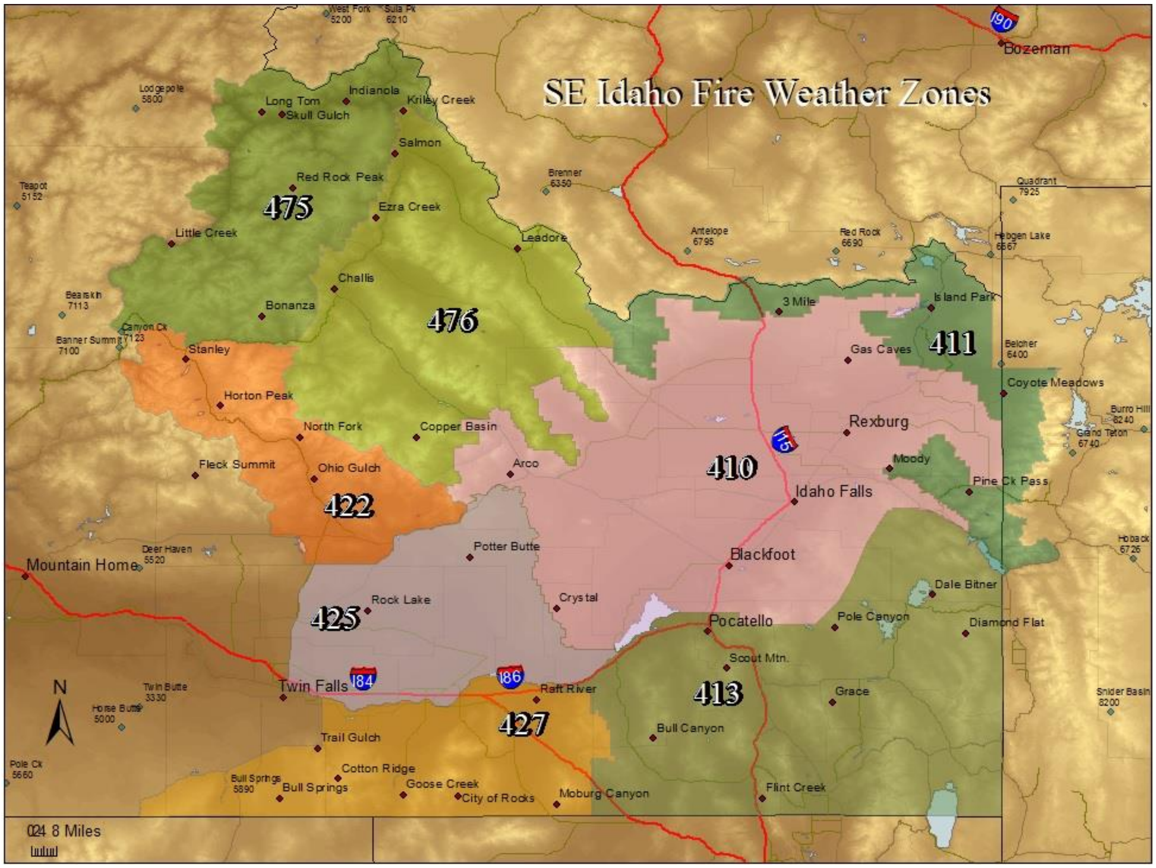

Figure 1 WFO Pocatello Fire Weather area of responsibility (solid color areas).

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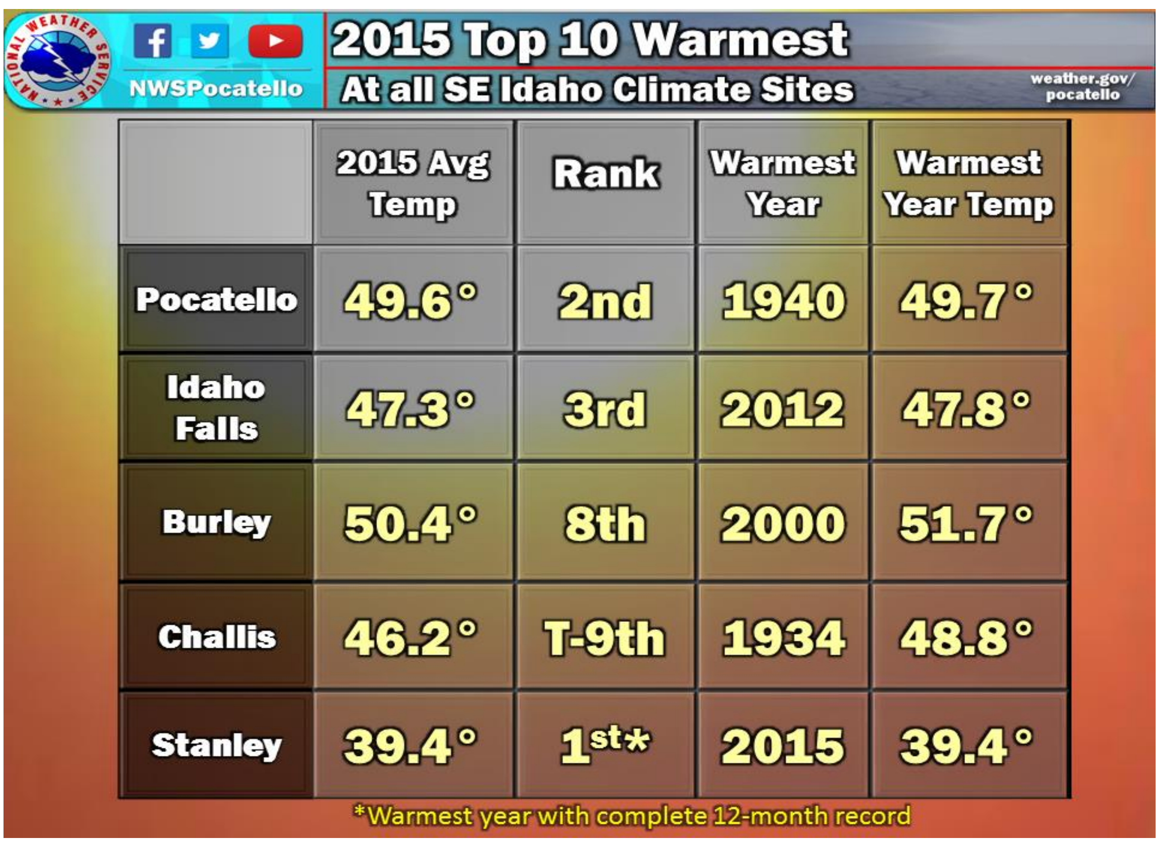
2. Overview of the fire season:

The El Niño/Southern Oscillation Index (ENSO) remained in a warmer than normal state (El Niño) through the winter of 2015-2016, waters in the Tropical Pacific cooled enough to return conditions to a neutral state by late May. Data so far shows this El Niño (November 2014 through May 2016) is one of the three strongest events since records began in 1950 and ties the record El Niño of 1997-1998; the third strongest El Niño was 1982-83. Temperature data for the year 2015 from the 5 main climate stations in Southeastern Idaho would place all stations in the top 10 warmest years on record (Figure 2.0). At the time this report was completed, the data for 2016 was not complete but temperatures were on track to be the warmest year on record for each of the 5 climate stations. This may not be due strictly to the ENSO cycle.

> The El Niño/Southern Oscillation (ENSO) cycle occurs over a two to seven year period and refers to conditions of sea surface temperatures in the tropical Pacific Ocean. Researchers have identified other cyclic patterns besides ENSO around the globe that may affect long term weather patterns. Some of these cyclic patterns may span 10 or even 30 years. Others may change every couple of weeks with little long term prediction value. La Niña (colder than normal) and El Niño (warmer than normal) are terms associated with extremes in the ENSO cycle. The ENSO cycle has a strong influence on global climate patterns and is a major player in long term climate outlooks.



	2015 Avg Temp	Rank	Warmest Year	Warmest Year Temp
Pocatello	49.6°	2nd	1940	49.7°
Idaho Falls	47.3°	3rd	2012	47.8°
Burley	50.4°	8th	2000	51.7°
Challis	46.2°	T-9th	1934	48.8°
Stanley	39.4°	1st*	2015	39.4°

Figure 2.0 Locations in Southeastern Idaho with average annual temperatures ranking in the 10 warmest years on record.

In a year where the Southern Oscillation Index is neutral, the upper level (jet stream) winds that play a role in the development and movement of storm systems will show a strong core over the Western Pacific with little extension to the east of the Dateline (Figure 2.1a). In Figure 2.1b, reanalysis of the upper level zonal winds for the winter months of December 2015 to February 2016, shows a more pronounced extension of these winds into the Eastern Pacific, which is supported by warmer than normal water temperatures in the tropical Central Pacific Ocean, El Niño. These winds help drive storm systems towards the west coast of North America, allow fewer events where cold polar air spills into Idaho, and moderate air temperatures that in-turn contribute to higher snow elevations.

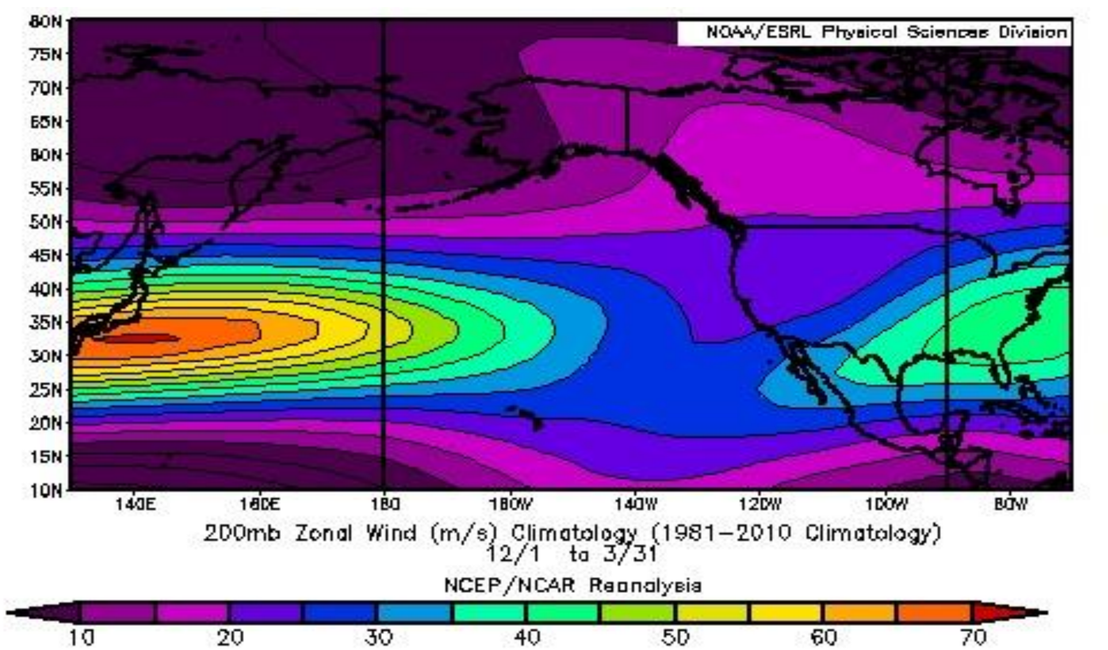


Figure 2.1a Department of Commerce, National Oceanic and Atmospheric Administration, ESRL Climatological reanalysis of 200 mb (about 40,000 feet above Mean Sea Level) zonal winds for the period 1981-2010. In a typical year, strong winds are located over the Western Pacific and show little extension east of the Dateline.

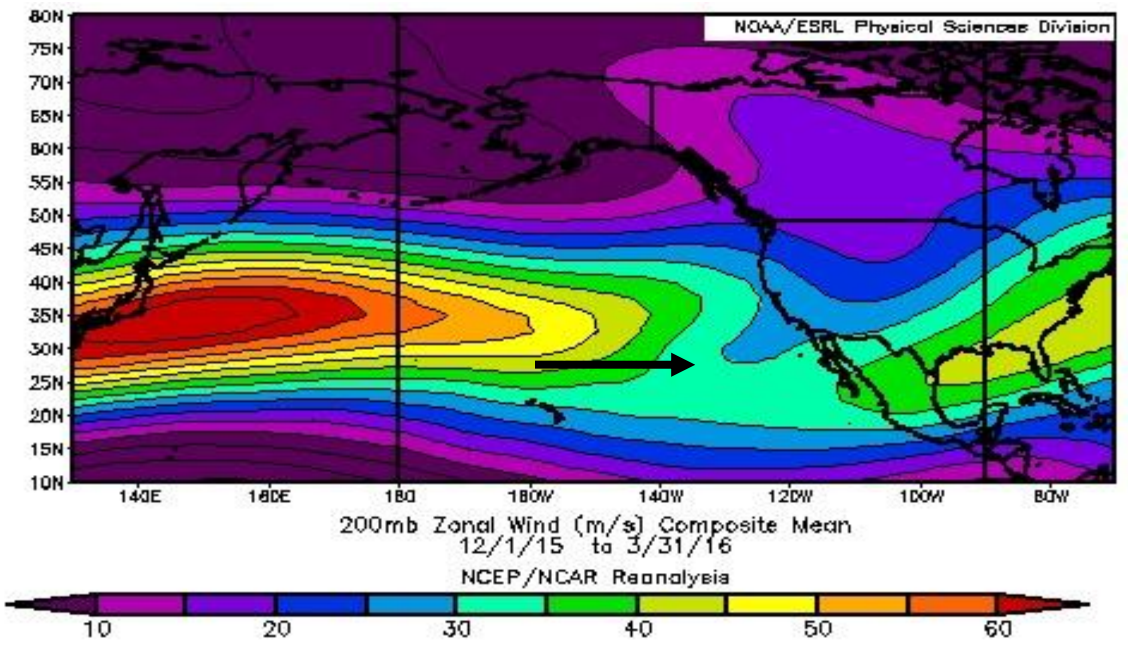


Figure 2.1b Department of Commerce, National Oceanic and Atmospheric Administration, ESRL composite reanalysis of 200 mb zonal winds for December 1, 2015 through March 31, 2016. During this El Nino year, strong upper level winds advanced over the Eastern Pacific and helped drive storm systems into the west coast of the United States. Relatively warmer maritime air also contributed to much higher snow levels in Idaho.

Westerly winds off the Pacific brought several disturbances and abundant precipitation to the Central Mountains during December 2015 and January 2016. Areas of the Challis and Sawtooth National Forests received 2 to 5 inches of liquid water equivalent precipitation above normal (Figure 2.2a). The south central highlands from Salmon Falls to Pomerelle fared well with snow packs hitting 150 to 190 percent of median. The Caribou Highlands fell a little below median. The National Resource Conservation Service in their Water Supply Outlook Report, January 1, 2016 believed the water supplies were looking "promising", but "Because of the lack of snow in the mid-elevations the past couple of years, drought concerns are still present". Snow water equivalent data from Morgan Creek SNOTEL (Figure 2.2b) indicated snow packs were out performing the winter of 2014-15 into early April and peaked a couple of weeks later. Above normal temperatures and elevated snow levels contributed to the snow packs ending at nearly the same time as in 2015.

Warm maritime air and westerly winds limited the opportunity for cold polar air to slip into Idaho. During October to December 2015, average temperatures were typically 1 to 3 degrees above normal (Figure 2.3a), and this increased sharply to 3 to 6 degrees above normal in the period from January through March 2016 (Figure 2.3b). The result was a rapid loss of snow packs in late March and April.

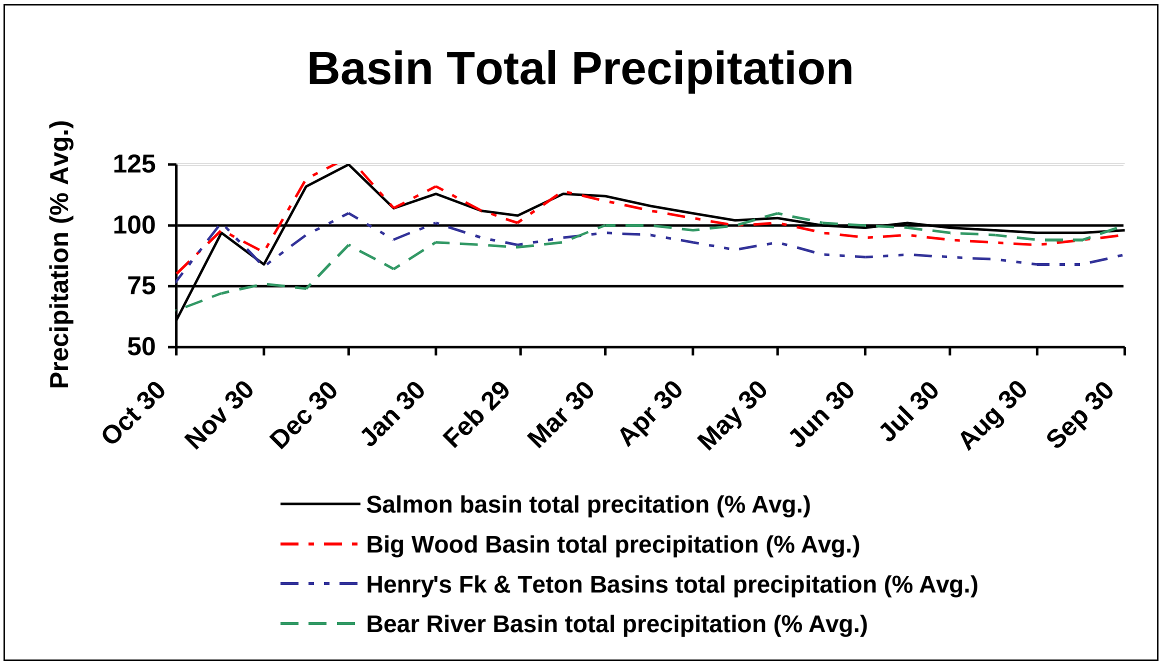


Figure 2.2a Total precipitation for select Southeast Idaho Basins. Data source is from the USDA Natural Resources Conservation Service, National Water and Climate Center, Portland Oregon.

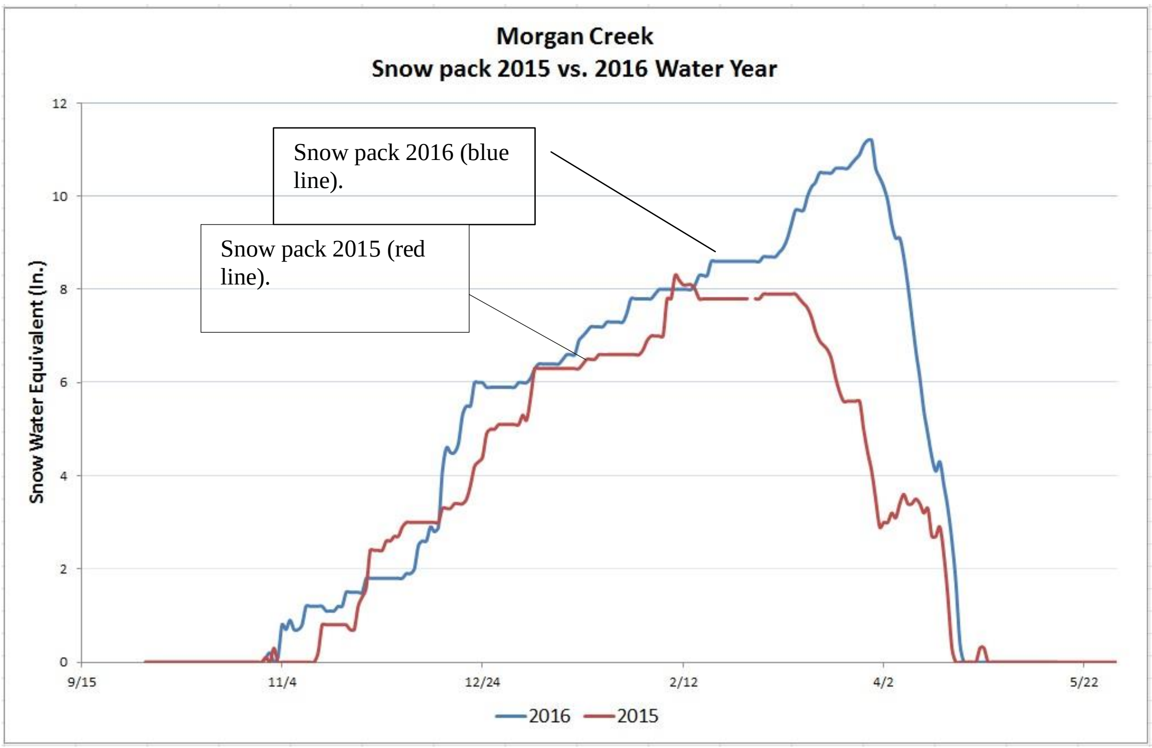


Figure 2.2b Snow packs of 2015 (red line) peaked about 3 weeks earlier than average. In 2016 (blue line) the snow packs were much deeper the first week of April, but the melt was quite sharp and ended nearly as fast as last year. Data source: Morgan Creek is a telemetered snow reporting station of the National Resource Conservation Service, located at 7600 feet elevation on Morgan Creek Road about 24 miles north of Challis, Idaho.

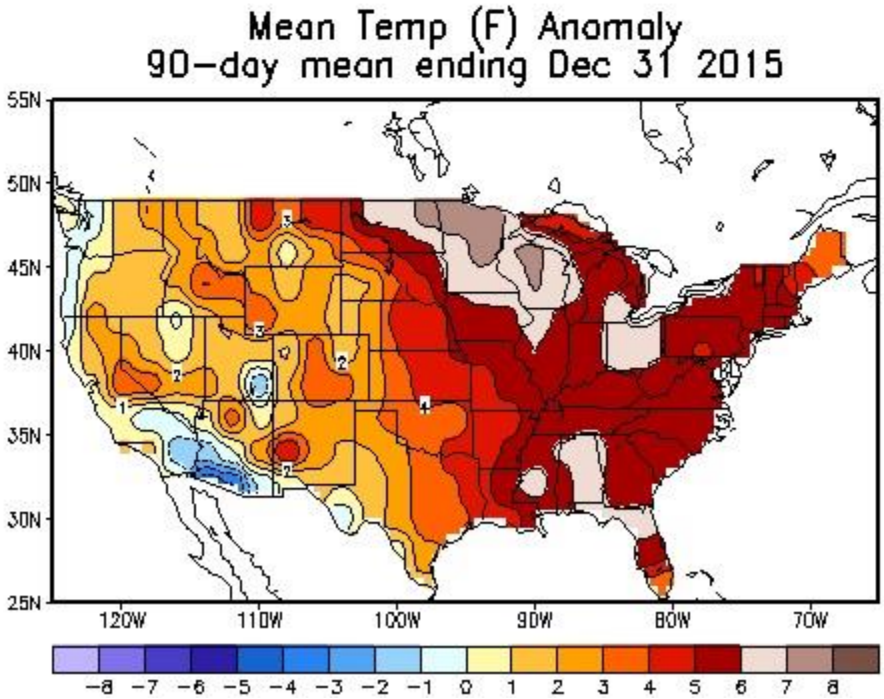


Figure 2.3a Temperature anomalies (F) for a 90 day period ending December 31, 2015. Climate Prediction Center, National Oceanic and Atmospheric Administration.

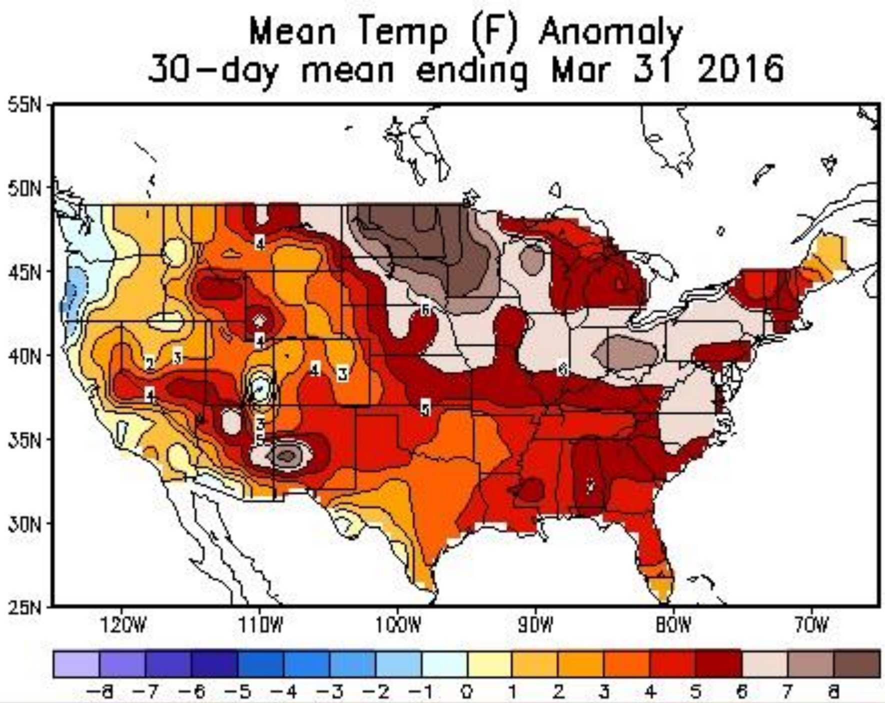


Figure 2.3b Temperature anomalies (F) for a 90 day period ending March 31, 2016. Climate Prediction Center, National Oceanic and Atmospheric Administration.

The broader scale picture of how the snow packs fared can be seen in Figures 2.4a and b. The month of November 2015 saw temperatures near or slightly above normal, providing a cooler break from the above normal temperatures that were so persistent, and opportunity for the snow packs to remain at middle and lower elevations for longer periods of time. Westerly winds often favor snow accumulation on the west facing slopes of the central mountains and the west facing slopes of the highlands along the Idaho and Wyoming border. This pattern would at times, break down into a splitting onshore pattern focused somewhere between the Coasts of British Columbia and Washington State. On several occasions, storm systems carried by the southern branch of this split favored significant accumulation of snow in the Southside Snake Basins including the Salmon Falls, Goose Creek, and Raft River areas where snow packs were 150 to 190 percent of median. The rest of the winter and spring months were warmer than normal and that would take a big toll on the snow packs.

By May 1st, the Southside Basin areas and limited portions of the Beaverhead and Bitterroot Mountains were the only areas with above normal snow packs. Above normal rainfall fell around Bear Lake, the Caribou National Forest, portions of the Southern Sawtooth Forest and the Snake Plain in May (Figure 2.5). This was followed by less than 50 percent of normal precipitation across all of Southeastern Idaho during June, July and August.

The first week in June saw water temperatures in the Equatorial Central Pacific return to normal, thus signaling the end of this strong El Niño Event. The pattern of westerly winds would continue to be dominant through the summer months. This was so significant that the contribution of the Southwest Area Monsoon to thunderstorms and lighting activity in Southeastern Idaho this fire season was limited to just 4 short-lived events on: July 31st, August 5-10th, August 31st, and a late season push of moisture September 30th and October 1st. There were a few days when thunderstorms were associated with frontal disturbances embedded in westerly winds off the Pacific.

There were 24 days this fire season when Red Flag conditions were observed somewhere in Southeastern Idaho. Strong gusty winds and low relative humidity were causal factors on 19 of these days. Thunderstorms greater than isolated in coverage were factors on just 7 days. There were 2 days when both strong winds and significant thunderstorm coverage occurred somewhere in the forecast area on the same day.

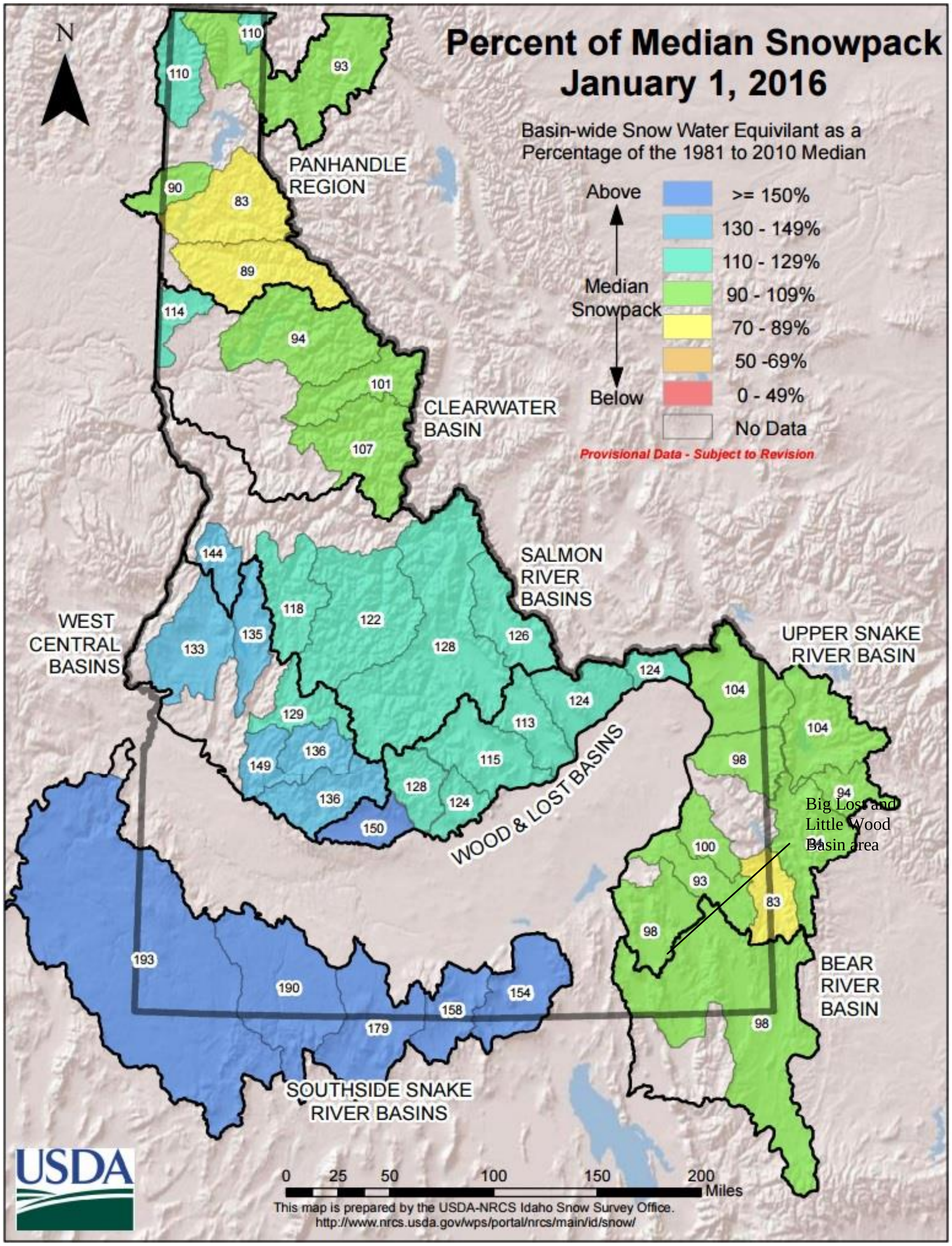


Figure 2.4a Mountain snow packs as determined from snow water equivalent. From USDA Natural Resources Conservation Service, National Water and Climate Center, Portland Oregon.

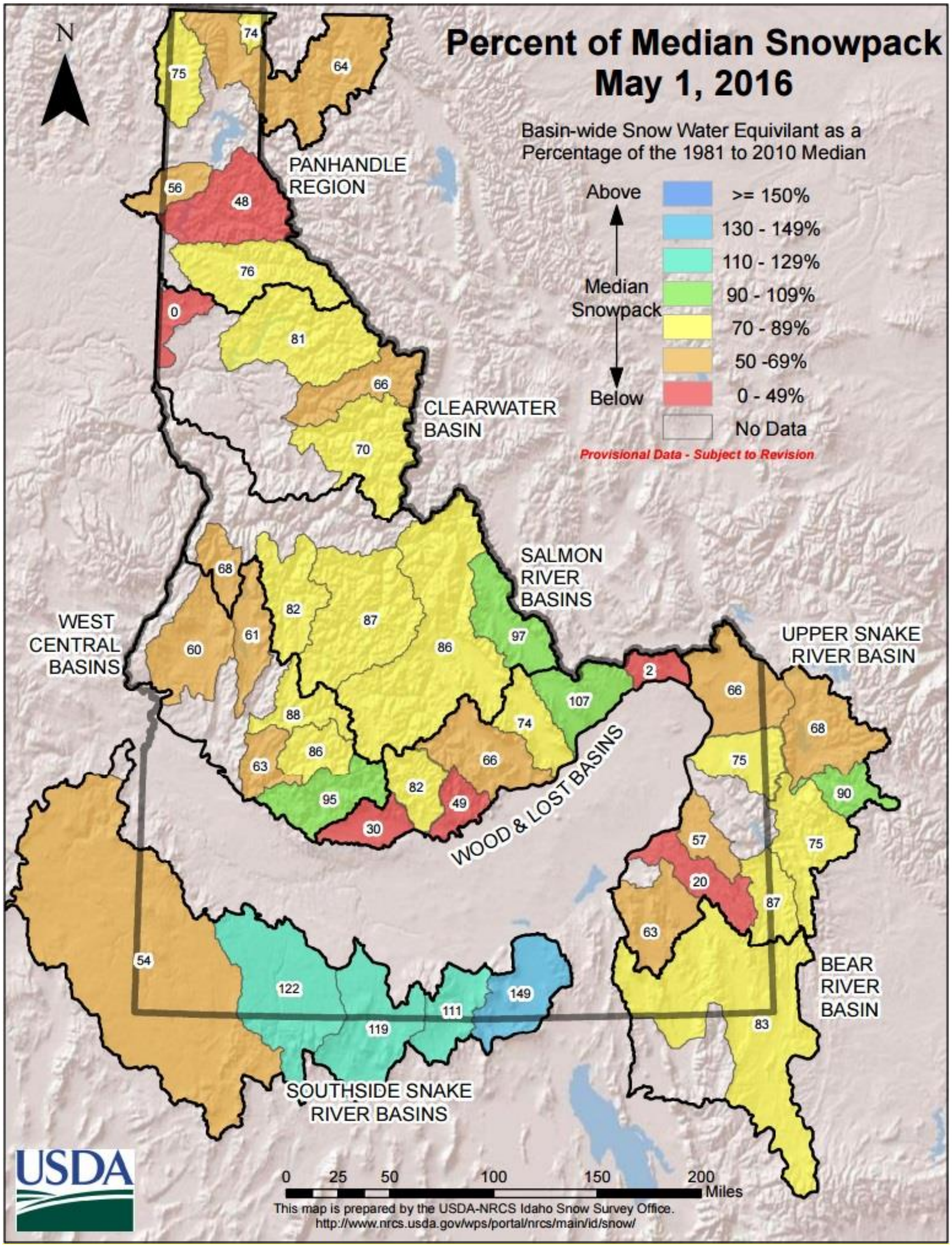


Figure 2.4b Mountain snow packs as determined from snow water equivalent. From USDA Natural Resources Conservation Service, National Water and Climate Center, Portland Oregon.

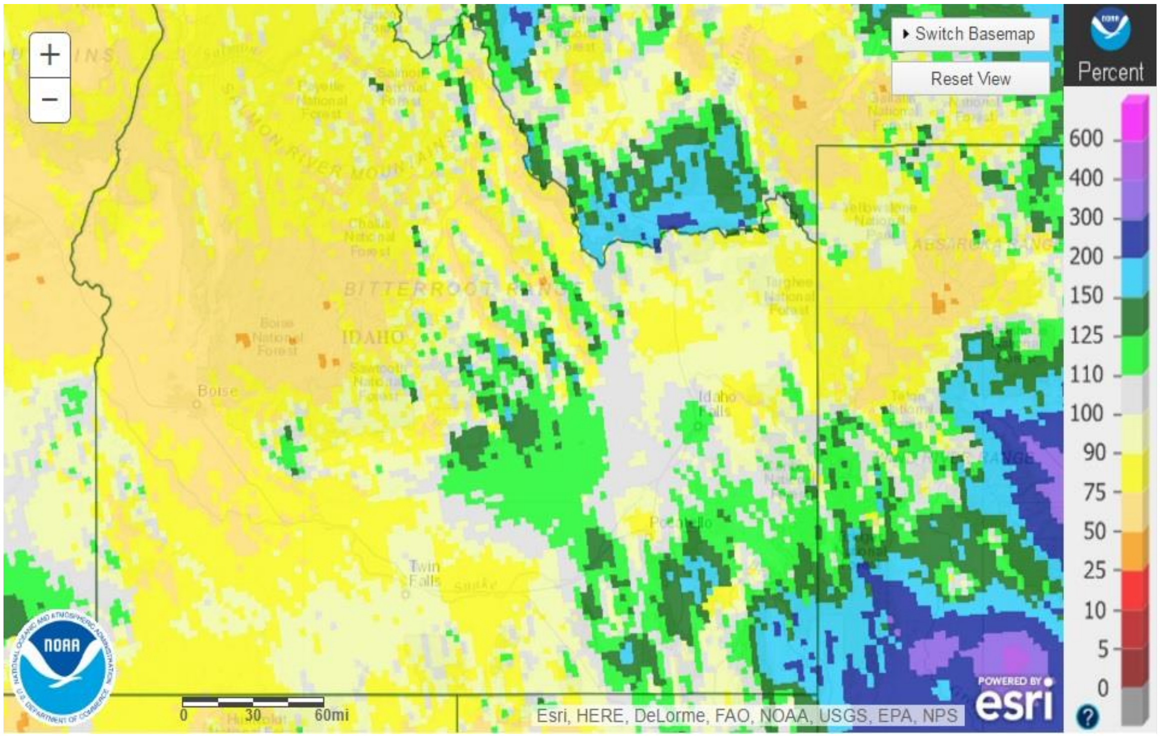


Figure 2.5 Advanced Hydrologic Prediction System (AHPS) showing departure from normal precipitation for May 2016. Portions of the Snake Plain, Southern Sawtooth Forest, Caribou Forest, and Northern Wasatch Mountains received above normal rain.

The lack of rain during the fire season and above average windy days contributed to drying of fuels as seen at Dubois and Sellers Creek (Figure 2.6a and b). Live fuel moisture samples at Sellers Creek were on a sharp downward trend until the end of July. There were scattered showers in the area and minimum relative humidity improved to 20 to 30 percent range about the time the fuels would have been sampled. Archived daily weather maps show a weak surge of monsoon moisture as well. The Portneuf, Blackfoot and Willow Basins also showed a sharp and early drop in snow packs.

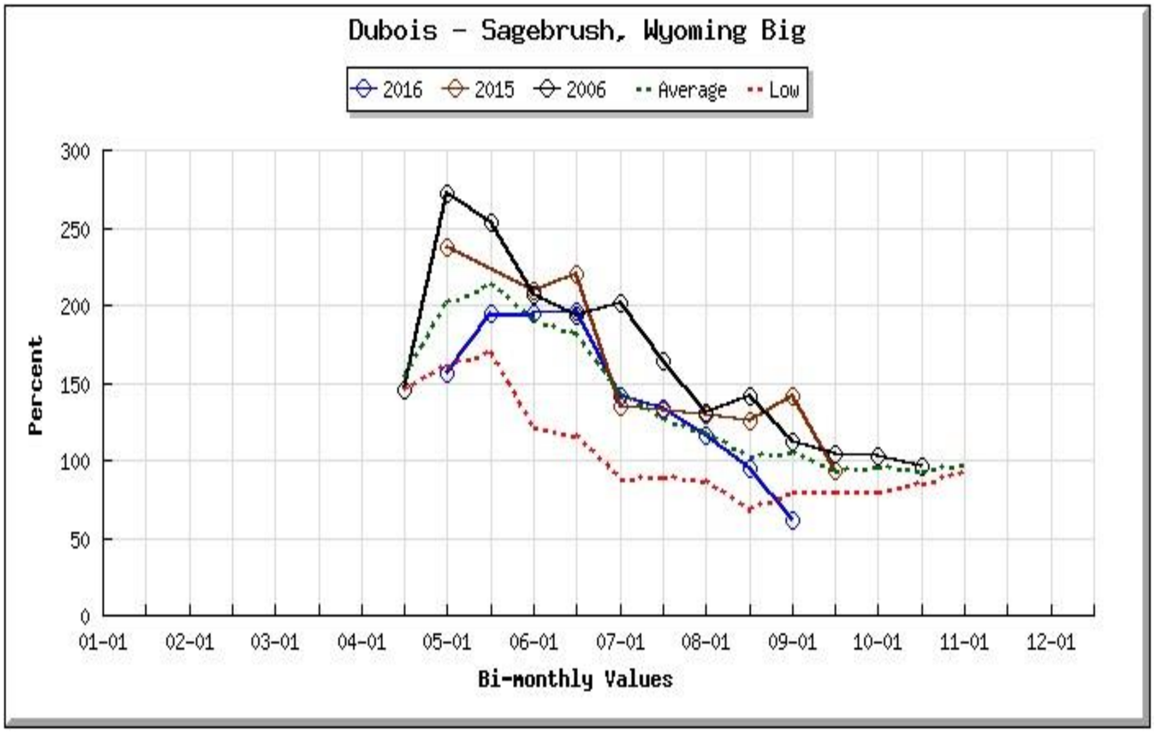


Figure 2.6(a) National Fuel Moisture Data Base, for Wyoming Big Sage Brush (Gas Caves RAWS station) near Dubois, Idaho.

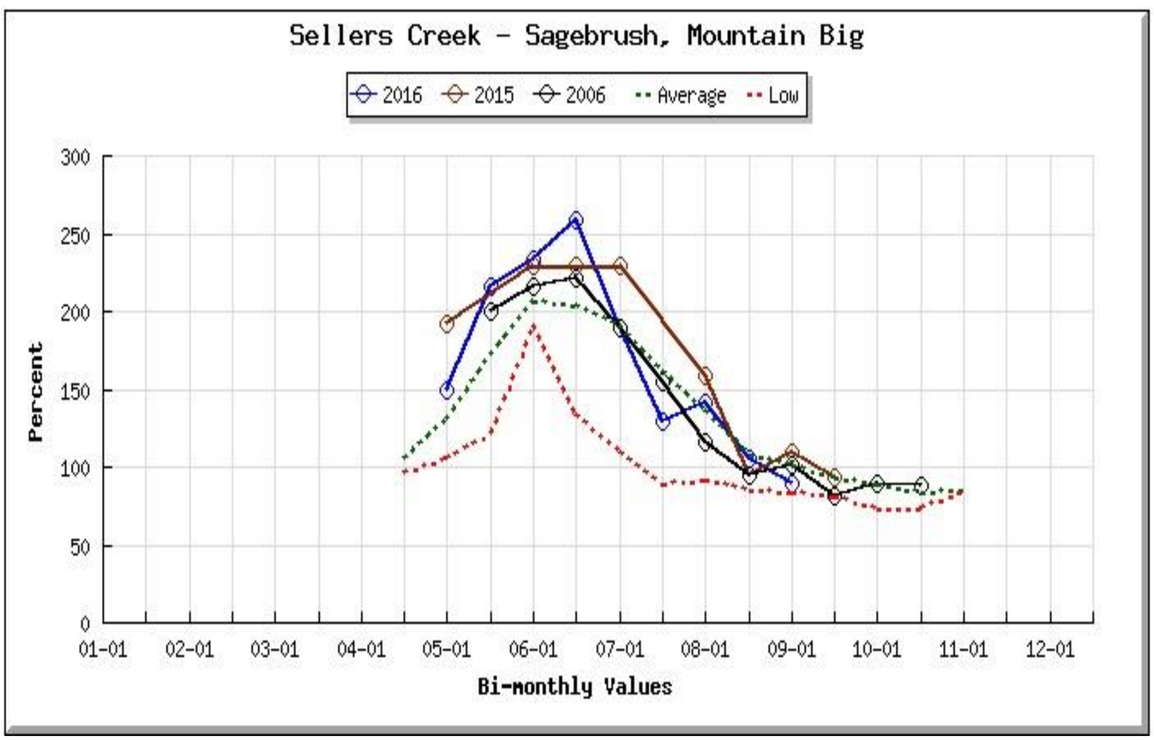


Figure 2.6(b) National Fuel Moisture Data Base, for Wyoming Big Sage Brush at Sellers Creek (Dale Bittner RAWS), near Wayan, Idaho.

The U.S. Drought Monitor (Figures 2.7a and b), showed a general trend towards abnormally dry conditions over the course of the fire season; of particular note is the moderate drought conditions in the Targhee National Forest area. Long term drought conditions persist in the central mountains following three years of above normal winter temperatures and loss of snow packs on the middle and lower slopes. This is highlighted by the Palmer Drought Severity Index (Figure 2.8).

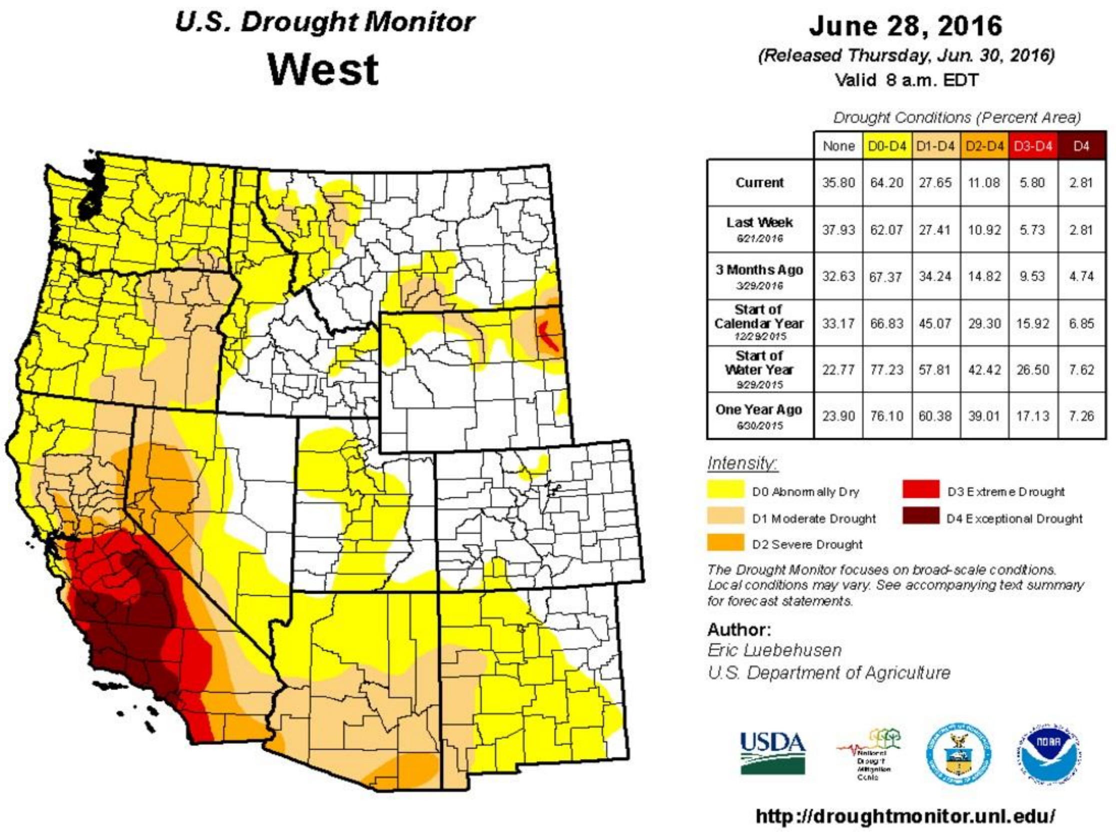


Figure 2.7(a) The U.S. Drought Monitor is based on a multi-index drought classification scheme and produced jointly by the National Drought Mitigation Center (University of Nebraska-Lincoln) and several federal partners including Joint Agricultural Weather Facility (U.S. Department of Agriculture and Department of Commerce/National Oceanic and Atmospheric Administration), Climate Prediction Center (U.S. Department of Commerce/NOAA/National Weather Service), and National Climatic Data Center (DOC/NOAA). At the beginning of fire season, conditions were near normal.

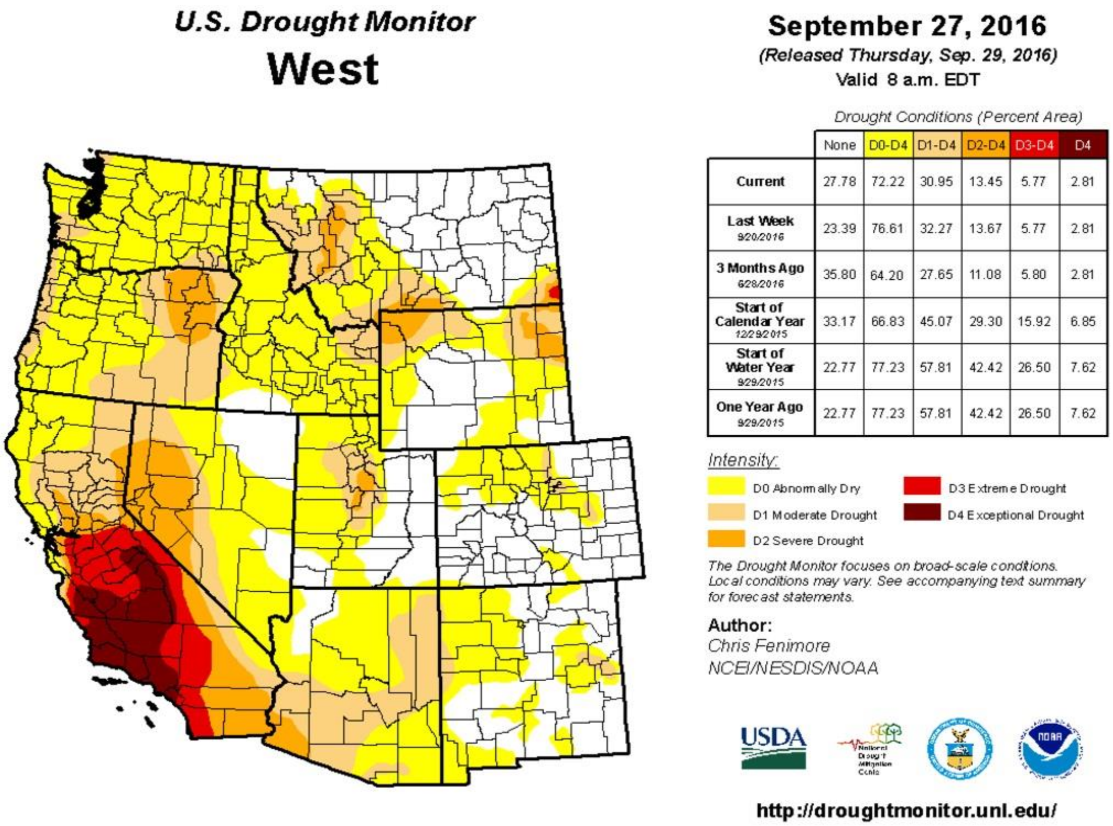


Figure 2.7(b) U.S. Drought Monitor showing abnormally dry conditions across Southeastern Idaho by late September.

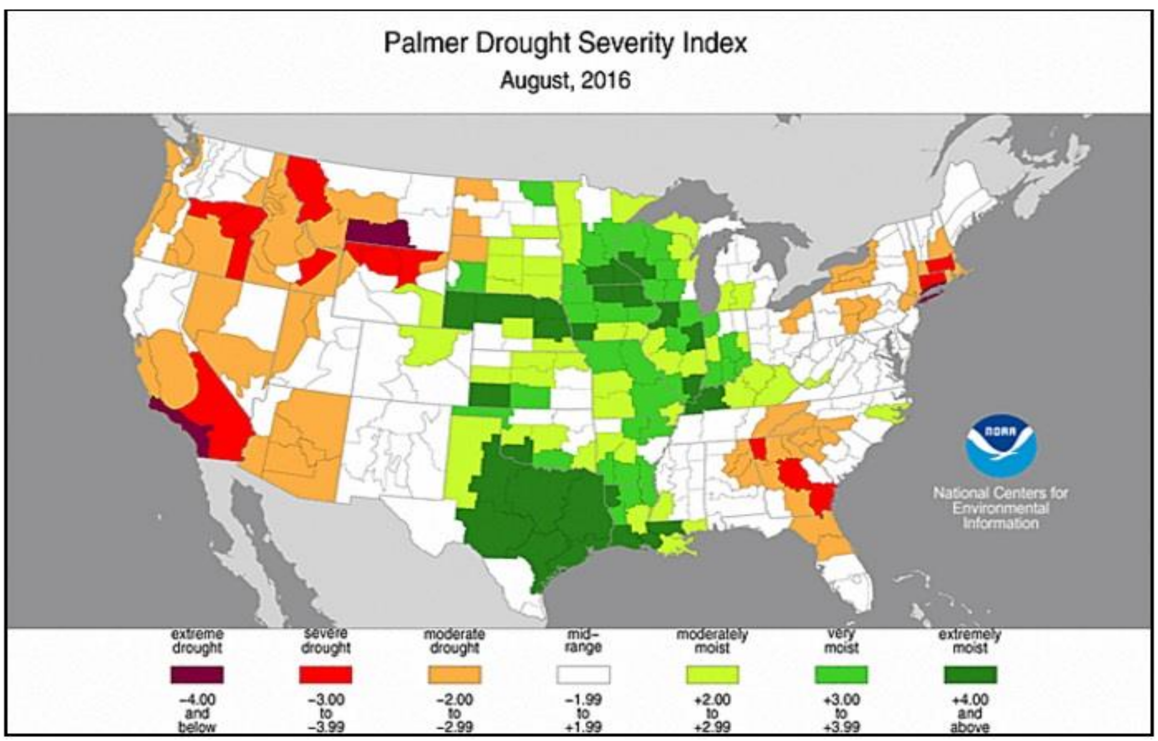
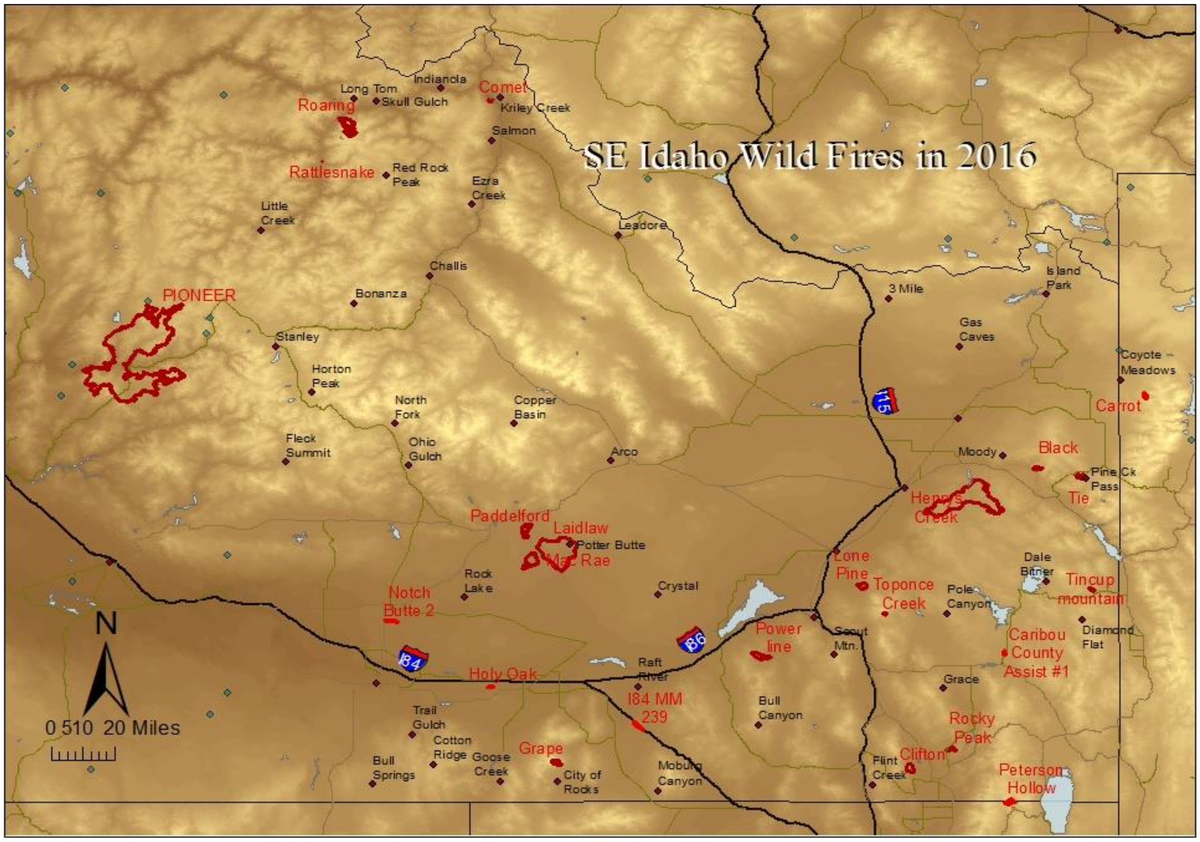


Figure 2.8 Palmer Drought Severity Index (August 2016) measuring long term meteorological conditions over many months.

Figure 2.9 Southeast Idaho Wild Fires in 2016.



Season ending events are not always straight forward. In September there were several days of gusty winds and fewer days with isolated thunderstorms. A well-developed low pressure system crossed through the Great Basin September 21st through the 25th. Widespread rain showers occurred over Southeastern Idaho from Twin Falls to the Wyoming border with total rainfall amounts of 0.5 to 1 inch pretty common. Some areas of the Caribou National Forest received in excess of 2 inches of rain and helped take the heat out of some ongoing wild fires. The corridor along US Route 93 between Challis and North Fork saw the least amount of rain, but still better than a quarter inch, Figure 2.9a. That disturbance passed and temperatures quickly rebounded to the 70's and 80's along with several days of strong and gusty winds. It was not until October 14th to the 19th when another storm system rolled through; this time with a rain and snow mix. Snow accumulation of 1 to 3 inches occurred at elevations above 6300 feet and rainfall amounts of 1 to 3 inches were reported over a 4 day period, Figure 2.9b.

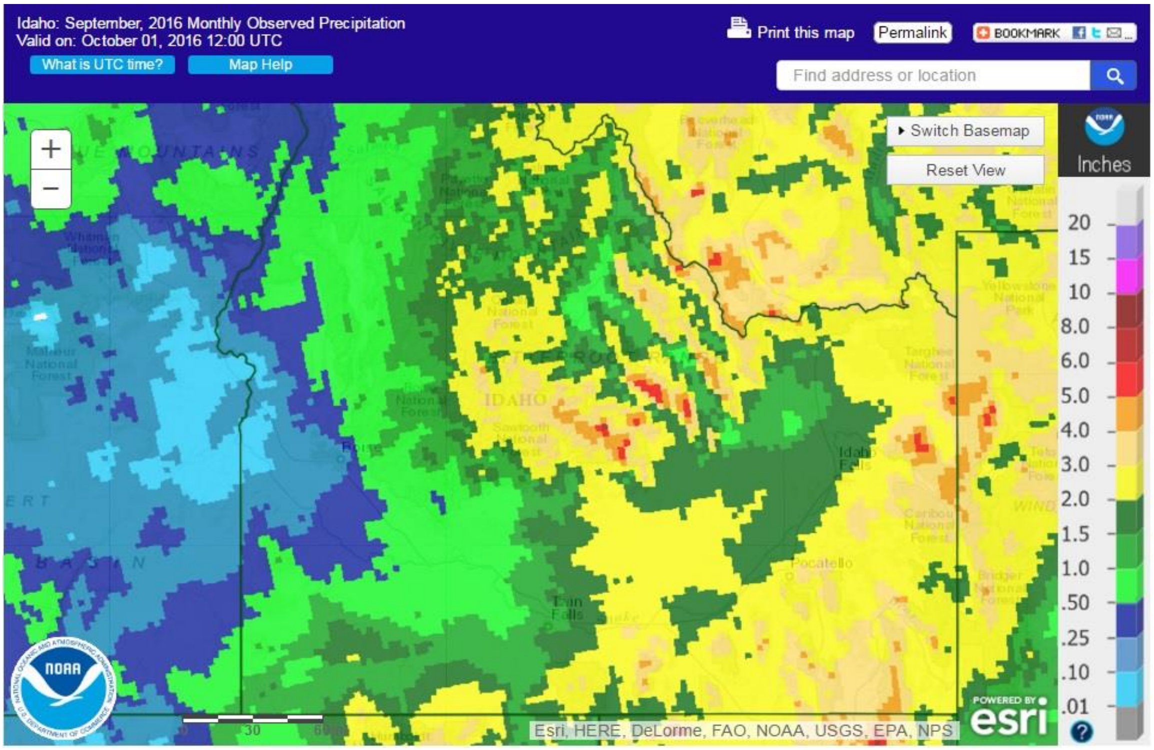


Figure 2.9a Advanced Hydrologic Prediction System (AHPS): Observed monthly precipitation for September, 2016. Most of the monthly total precipitation resulted from a widespread rain event across all of Southeastern Idaho between September 21 and 24, 2016.

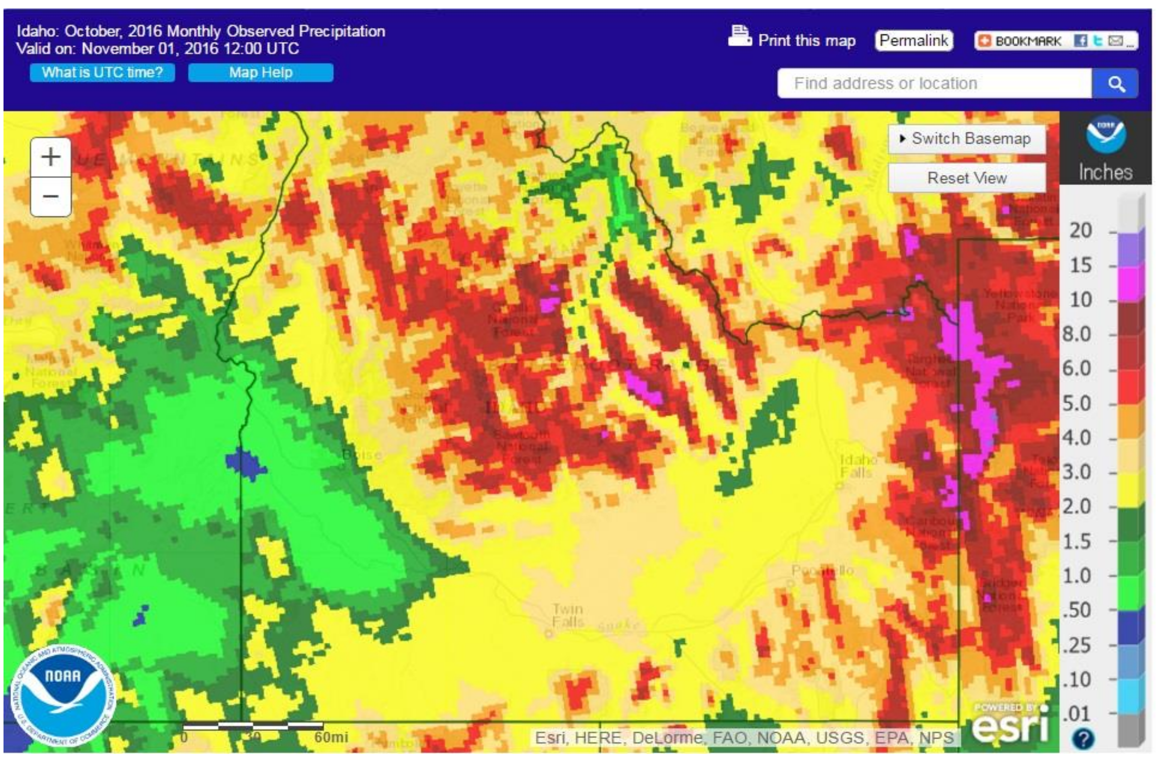


Figure 2.9b Advanced Hydrologic Prediction System (AHPS), observed precipitation for the month of October 2016. Widespread precipitation occurred on October 1-3rd, 14th-18th, and 24-25th, 2016.

3. Weather in review: September 2015 – September 2016

September and October 2015. The first few days of September were dry and non-eventful. A vigorous storm system entered the Pacific Northwest coast September 14th to 17th with widespread showers across southeastern Idaho. Measured precipitation amounts included Salmon 0.11 inches; Challis 0.41 inches; Stanley 1.25 inches; Idaho Falls 0.52 inches; Pocatello 0.78 inches; and Burley 0.43 inches of rain. At first glance this appeared to be a season ending event, but most of the rest of September and the first half of October saw well above seasonally normal temperatures. Stanley set new record highs on the 14th, 15th, and 16th of October; and Burley a record high of 87F on the 10th of October. Afternoon humidity in the Snake Plain would occasionally drop to 9 to 15 percent in limited areas. It wasn't until a strong storm system came through October 18th to the 20th, followed by much cooler temperatures the third week of October, that temperatures in the 40's and 50's became common.

November and December 2015. No less than 10 weather disturbances entered the Pacific Northwest Coast and crossed Southeast Idaho during the months of November and December. Average temperatures in November were near normal across this area, but overall temperatures from October 1st to December 31st were 1 to 3 degrees Fahrenheit above average. By the end of December, snow packs across the central mountains were running 115 to 130 percent above the median, the Salmon Falls and Goose Creek area 150 to 190 percent of median, while the headwaters of the Upper Snake were just 95 to 105 percent of median. For the Central Mountains, this was nearly double the precipitation of this time last year.

January and February 2016. The upper level winds over the Eastern Pacific were lighter during this time resulting in fewer disturbances moving inland. Temperatures across Southeast Idaho were running 3 to 6 degrees Fahrenheit above average. Significant storm systems crossed the area on January 15 to 21st, February 12 to 15th, and February 18 to 20th. Snow packs did not increase substantially, but at least they were maintained. Temperatures in the lower valleys were occasionally above freezing with a little melting on the lower slopes.

March and April 2016. The frequency of storm systems increased during March; much of the mountain areas received up to 2 inches of precipitation above normal, or 125 to 150 percent of normal. The strong El Niño continued and brought temperatures 4 to 7 degrees Fahrenheit above average. Snow began to melt on the middle and lower slopes and became very pronounced the later part of March through April. A number of SNOTEL reporting sites below 7500 feet of elevation reported snow completely melted out by the 15th of April.

May 2016. Widespread rain showers and wetting rains covered most all of Southeastern Idaho May 7th through 9th and May 20th through 23rd. There were several smaller precipitation events over the course of the month. Warm temperatures continued to be a factor; the Pocatello Regional Airport reported afternoon high temperatures of 83F on May 5th and again on the 14th. The monthly total precipitation was above normal in the Caribou National Forest and portions of the Snake Plain from Picabo to Arco. Elsewhere, precipitation was generally below normal for the month. The strong El Niño event came to an end about the third week of May.

June 2016. Snow packs at the start of the month were mostly gone with the exception of the Southside Basins, including Salmon Falls and Goose Creek where mountain snow packs were still at 110 to 150 percent of median. Westerly winds off the Pacific would be the story this summer. During June, there were at least 12 days with breezy winds in this area. Precipitation for the month was less than 50 percent of normal across the entire area. For Fire Weather Warning purposes, fuels were first declared Critical in the Caribou Highlands on June 29th. No warnings were issued this month.

July and August 2016. The persistence of the westerly winds this fire season was substantial and was a factor in 19 of the 24 days when Red Flag conditions were met this fire season. The Southwest Monsoon for most of the season was located across Tucson, Arizona to Oklahoma and Kansas with very short periods where sub-tropical moisture advanced northward to Idaho. Red Flag conditions based on strong gusty winds and low relative humidity were present somewhere in Southeastern Idaho July 16, 18, 19, 20, 22, 23, 29, 30, and 31st. Thunderstorms were significant enough to warrant Red Flag Warnings on July 26th and 29th.

During August, Red Flag Warnings for wind and low relative humidity were in effect August 2, 7, 9, 22, 23, 30, and 31$^{st.}$. Thunderstorms were a significant factor ($\geq$25% coverage) on August 6, 7, 17, and 18th.

September and October 2016. Additional days with strong gusty winds and low relative humidity occurred on September 1st, 2nd, and 11th. A strong low pressure system crossed through the Great Basin September 21st through the 25th. Widespread rain showers occurred over Southeastern Idaho from Twin Falls to the Wyoming border with total rainfall amounts of 0.5 to 1 inch pretty common. Portions of the Caribou National Forest received in excess of 2 inches of rain. The corridor along US Route 93 between Challis and North Fork saw the least amount of rain, but still better than a quarter inch. That disturbance passed and temperatures quickly rebounded to the 70's and 80's along with several days of strong and gusty winds. It was not until October 14th to the 19th when another storm system rolled through, this time with a rain and snow mix. Snow accumulation of 1 to 3 inches occurred at elevations above 6300 feet and rainfall amounts of 1 to 3 inches were reported over a 4 day period.

4. Precipitation and Dry 1000 hour fuels by zone:

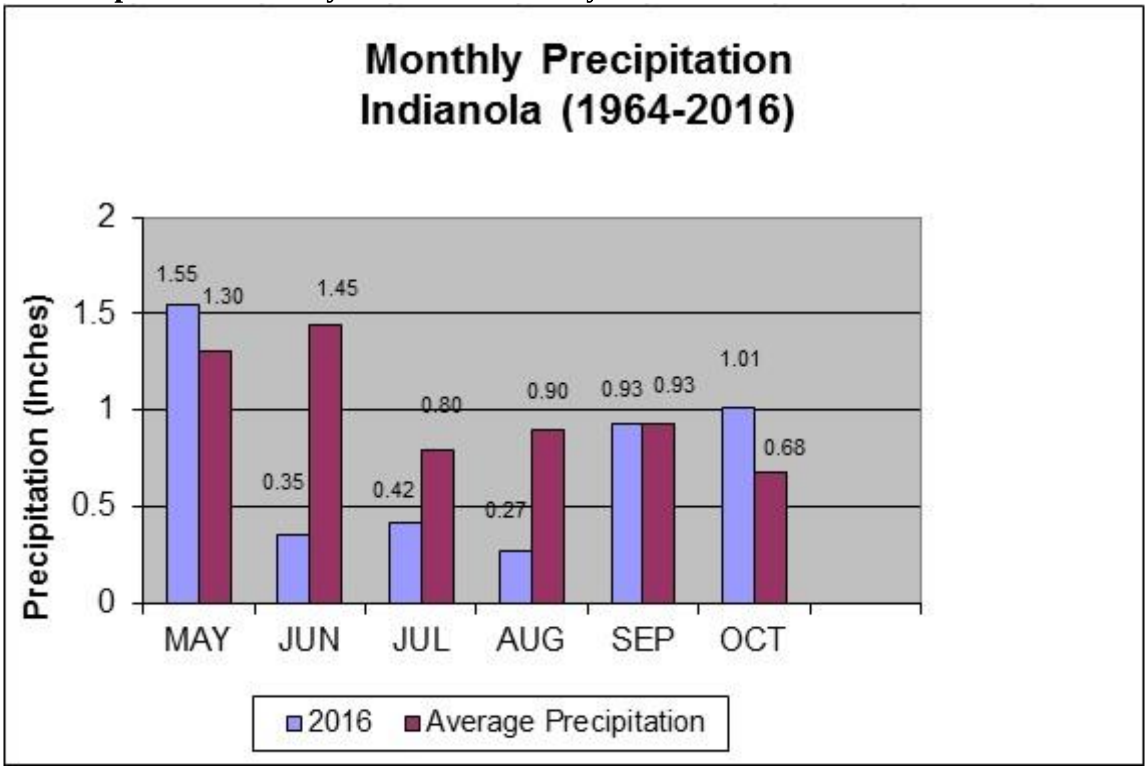


Figure 4.1(a) Observed and average precipitation at Indianola RAWS site, Fire Weather Zone 475.

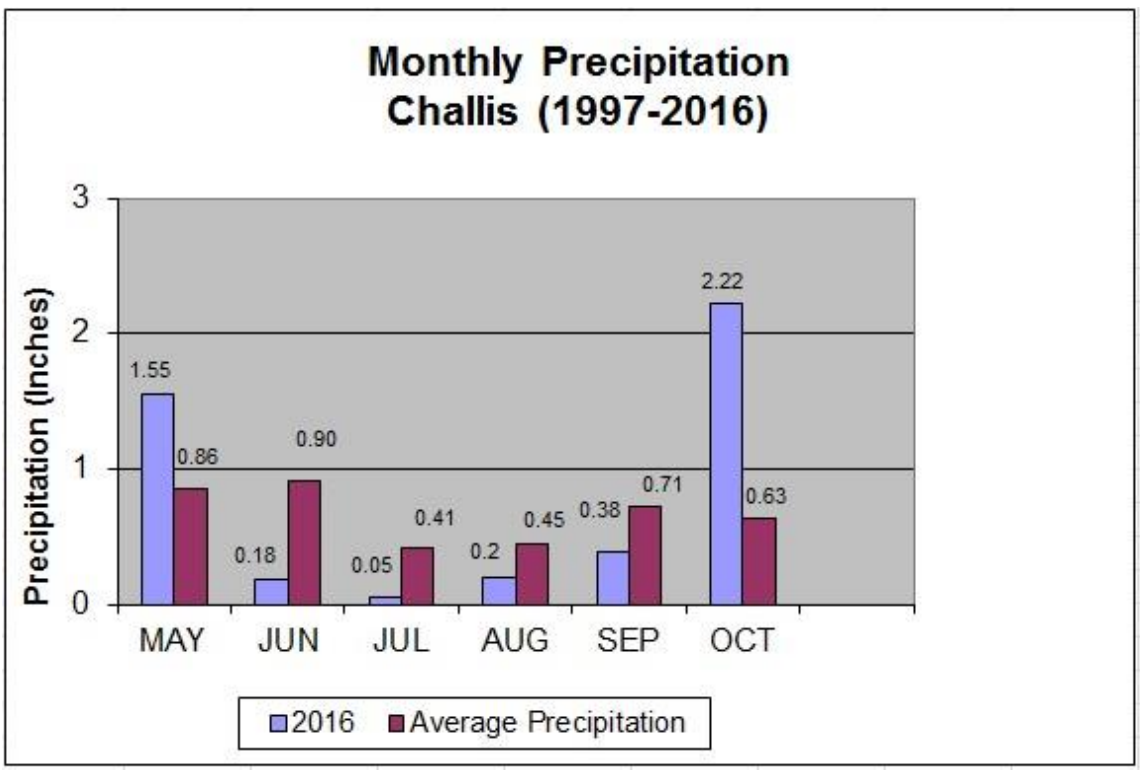


Figure 4.1(b) Observed and average precipitation at Challis RAWS site, Fire Weather Zone 476.

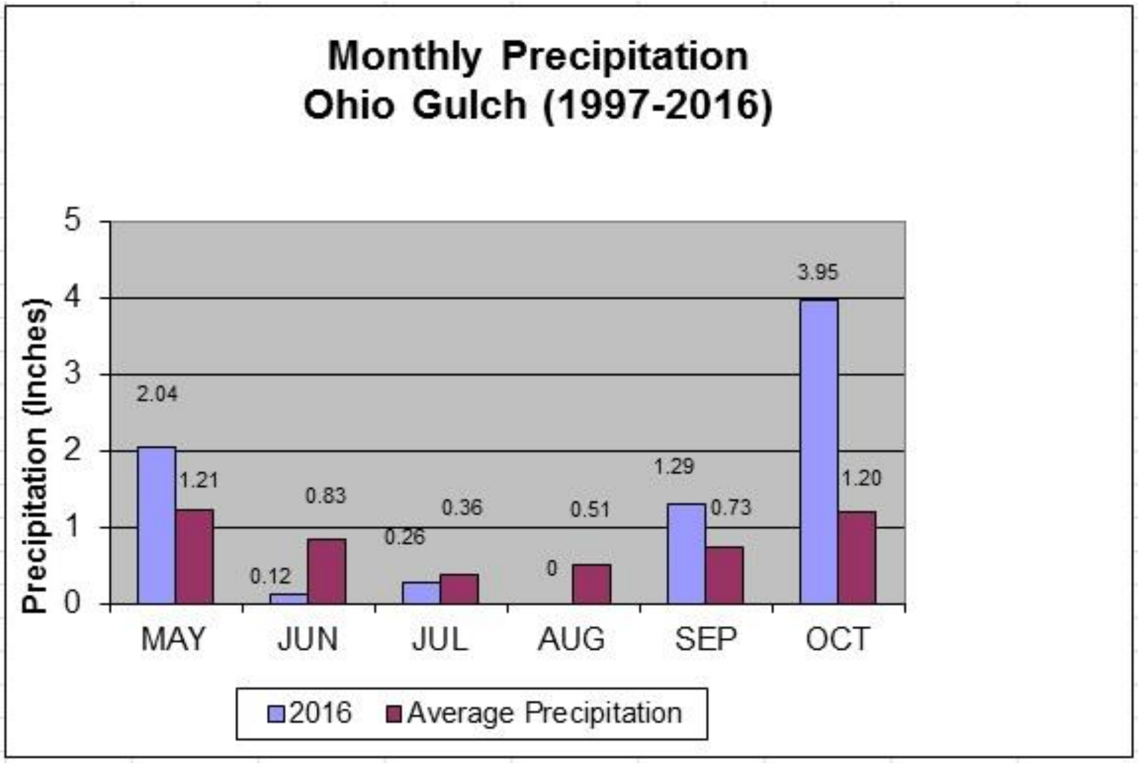


Figure 4.1(c) Observed and average precipitation at Ohio Gulch RAWS site, Fire Weather Zone 422.

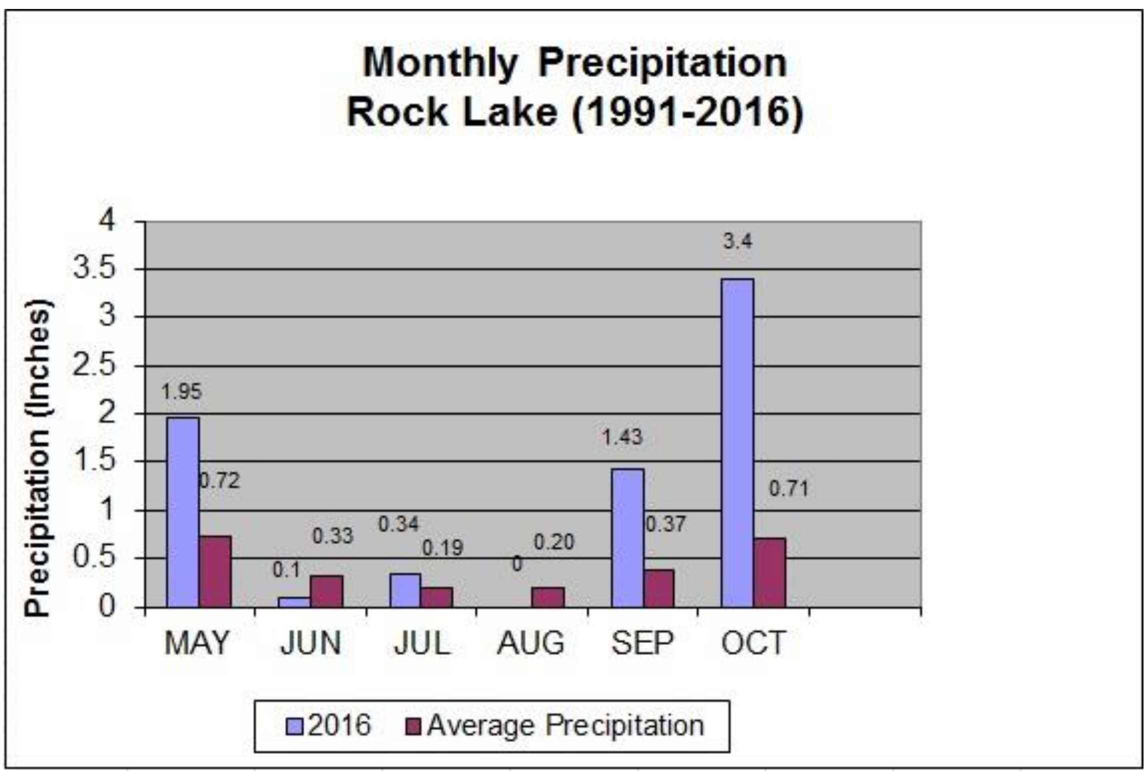


Figure 4.1(d) Observed and average precipitation at Rock Lake RAWS site, Fire Weather Zone 425.

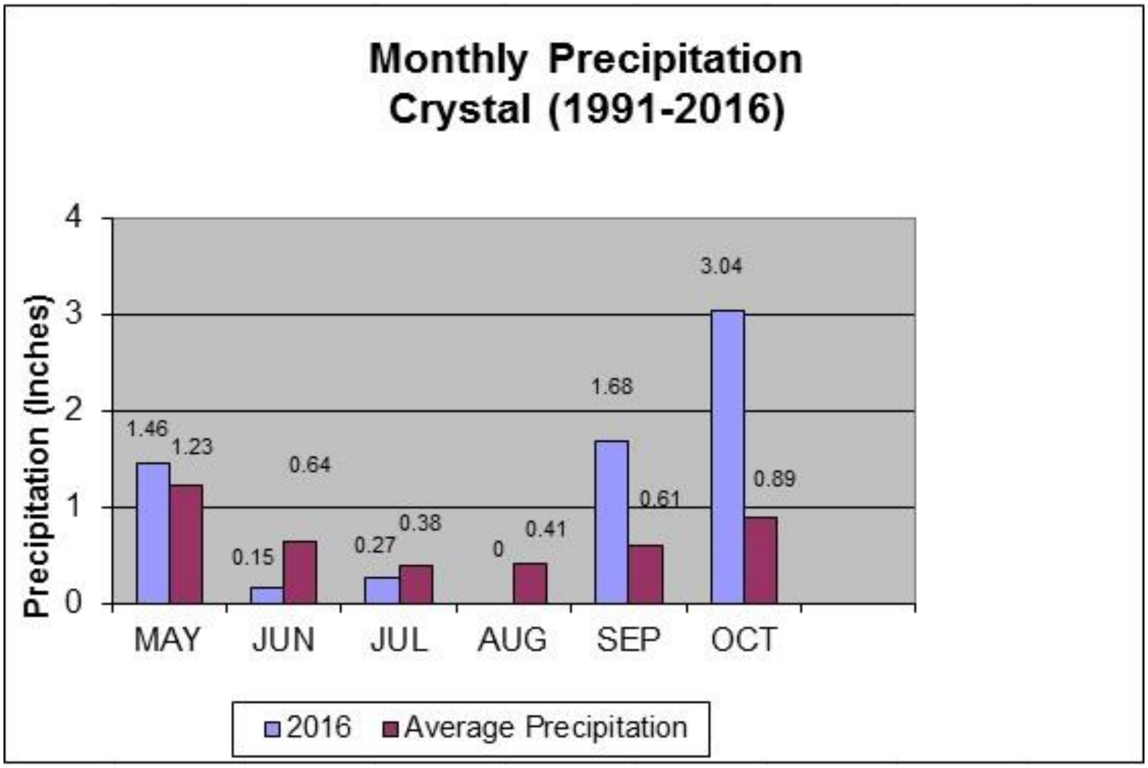


Figure 4.1(e) Observed and average precipitation at Crystal RAWS site, Fire Weather Zone 410.

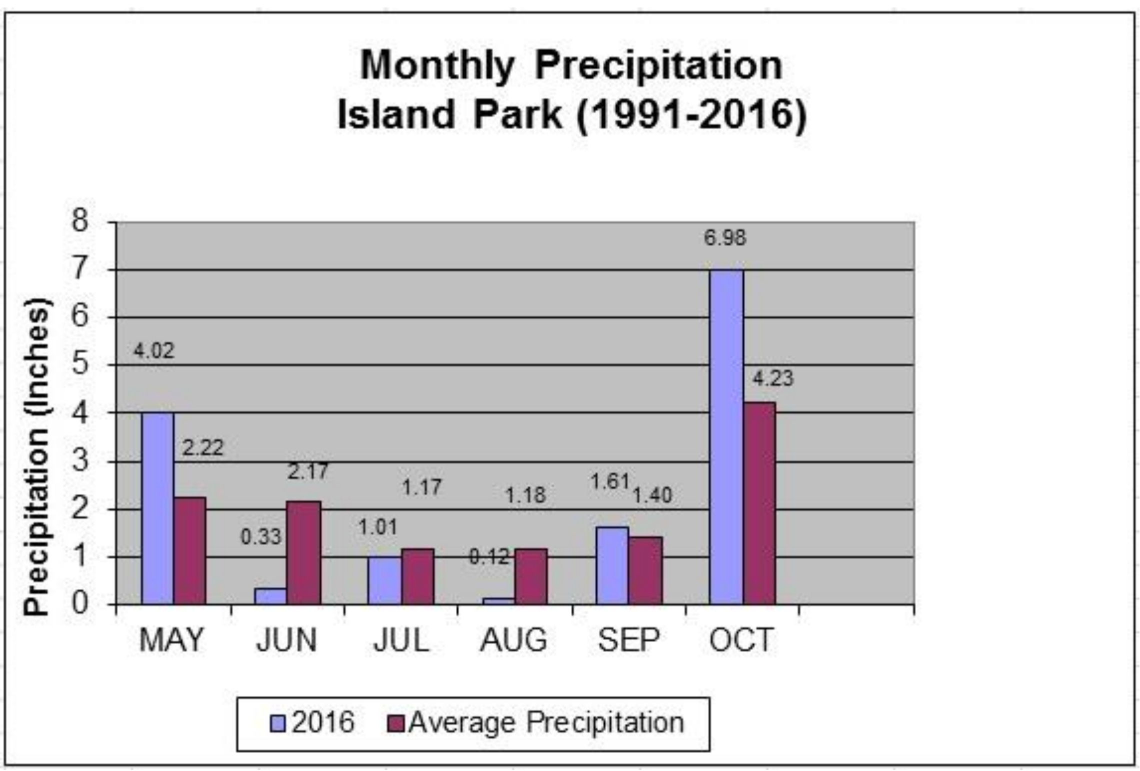


Figure 4.1(f) Observed and average precipitation at Island Park RAWS site, Fire Weather Zone 411.

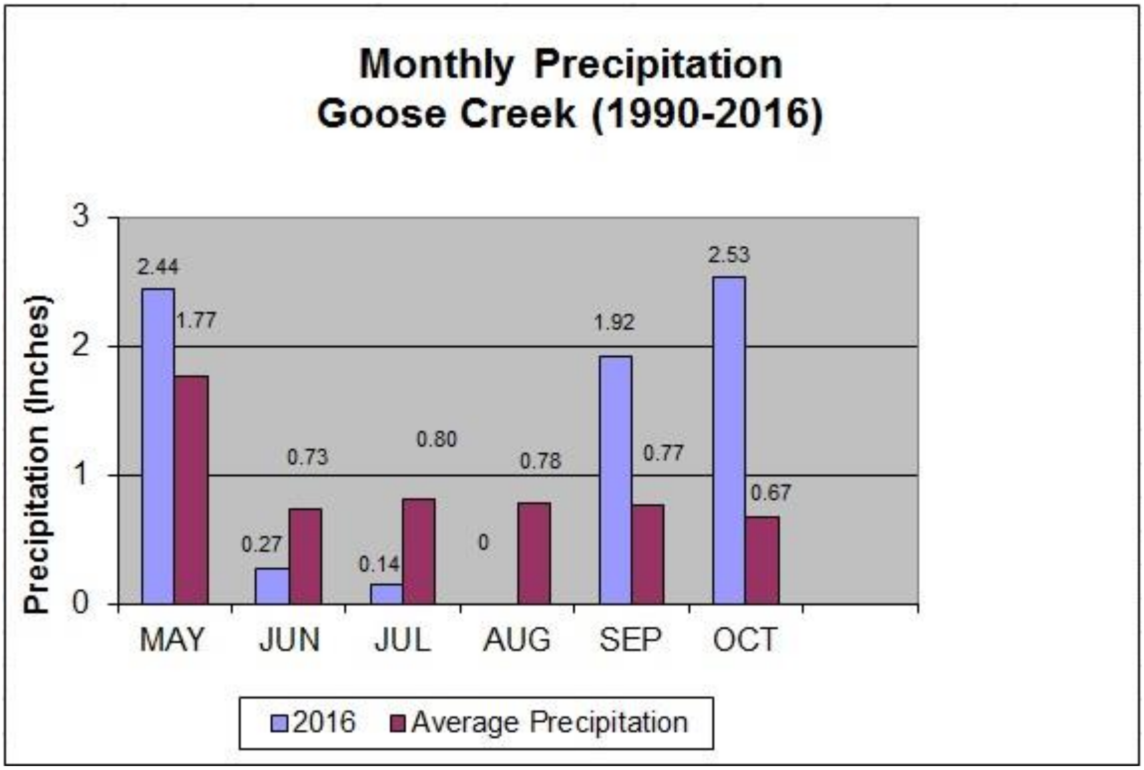


Figure 4.1(g) Observed and average precipitation at Goose Creek RAWS site, Fire Weather Zone 427.

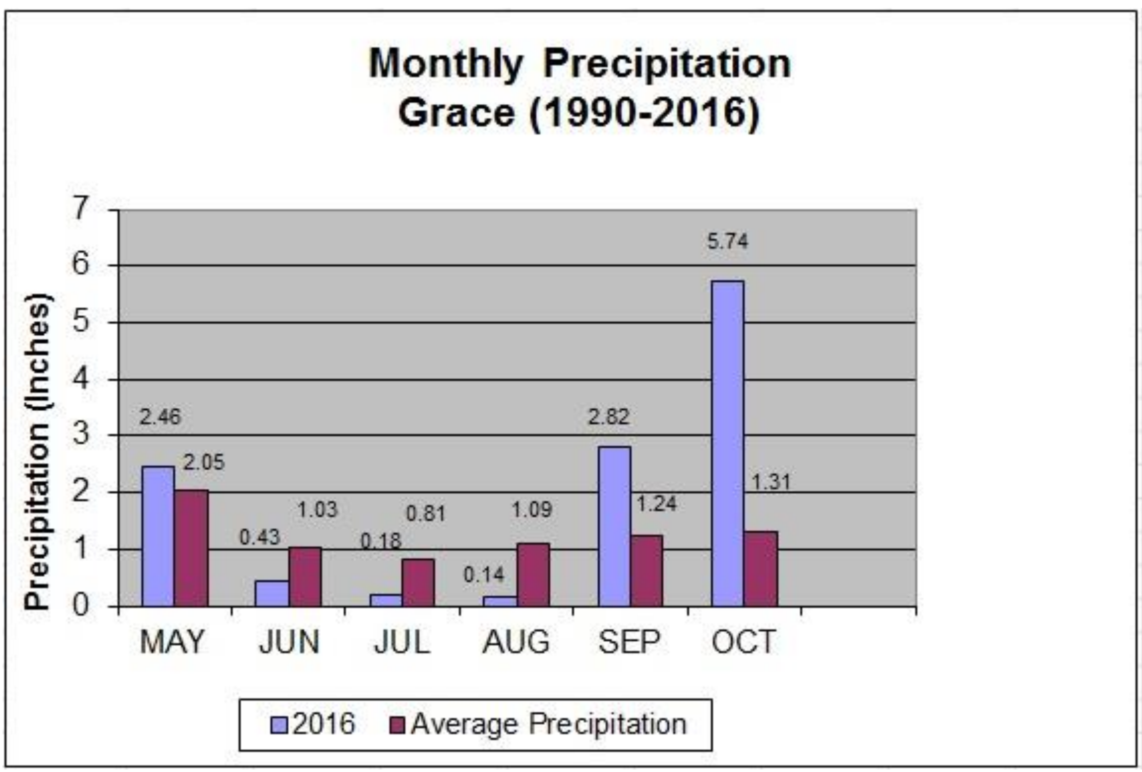


Figure 4.1(h) Observed and average precipitation at Grace RAWS site, Fire Weather Zone 413.

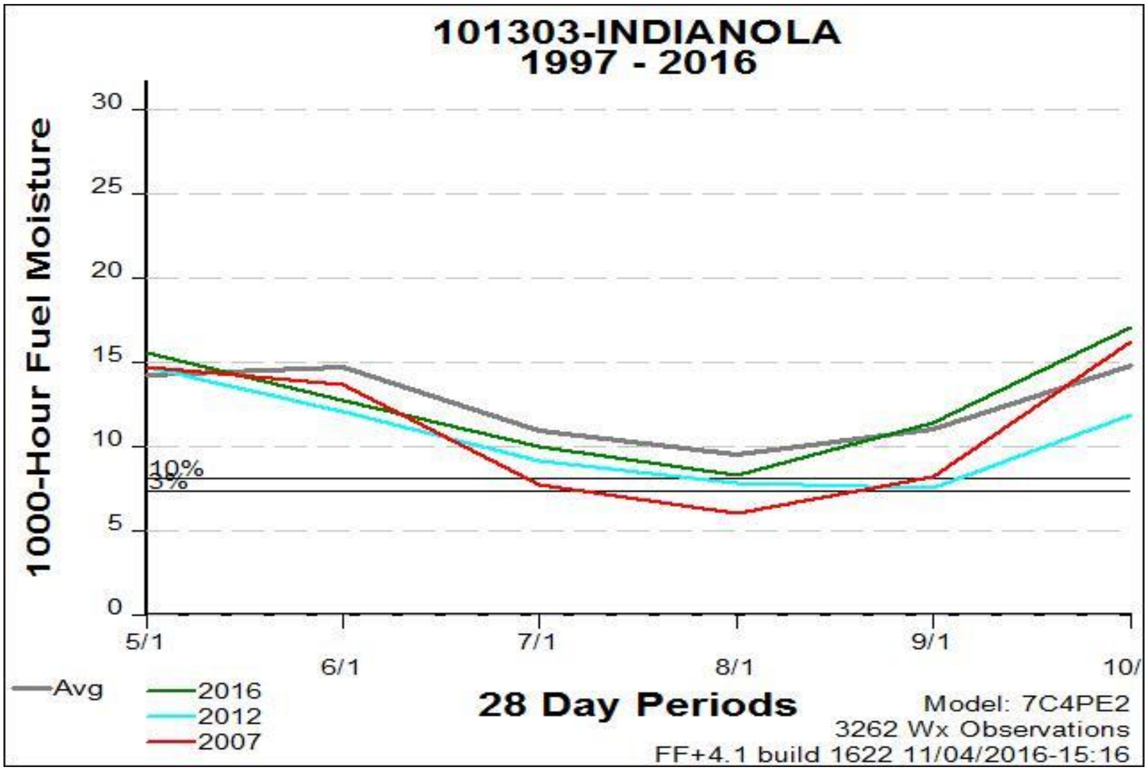


Figure 4.2(a) Observed and average 1000 Hour Fuel Moisture at Indianola RAWS site, Fire Weather Zone 475.

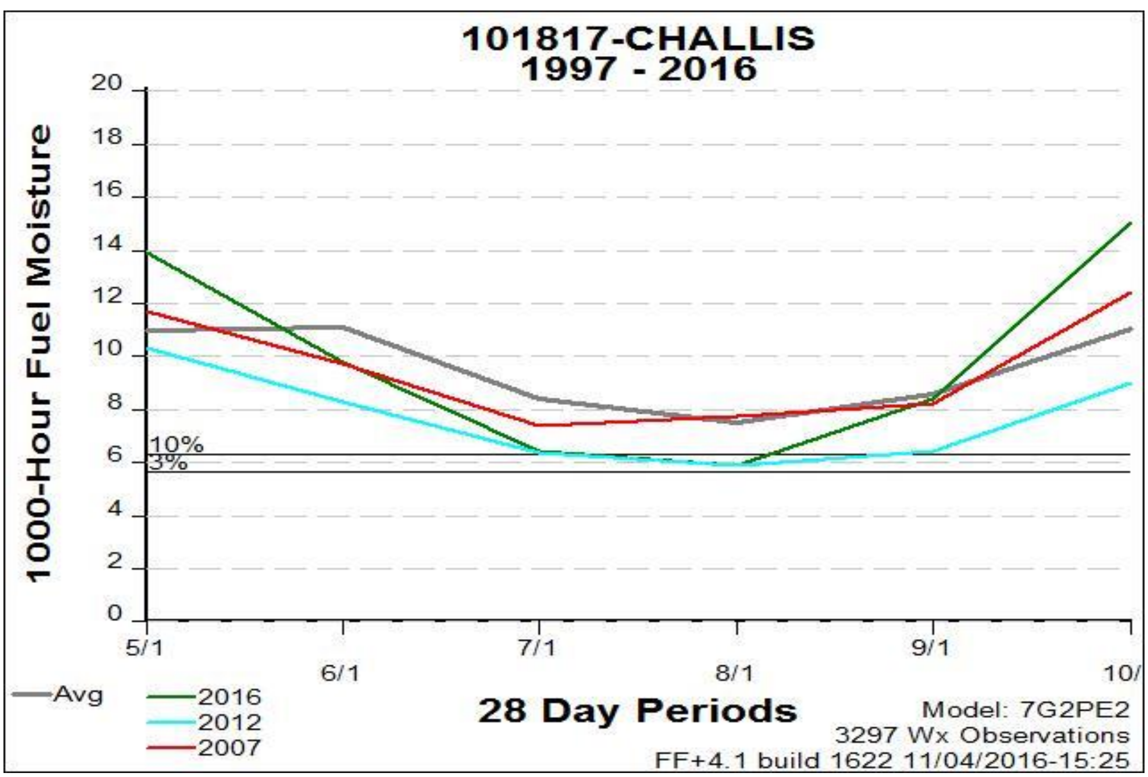


Figure 4.2(b) Observed and average 1000 Hour Fuel Moisture at Challis RAWS site, Fire Weather Zone 476.

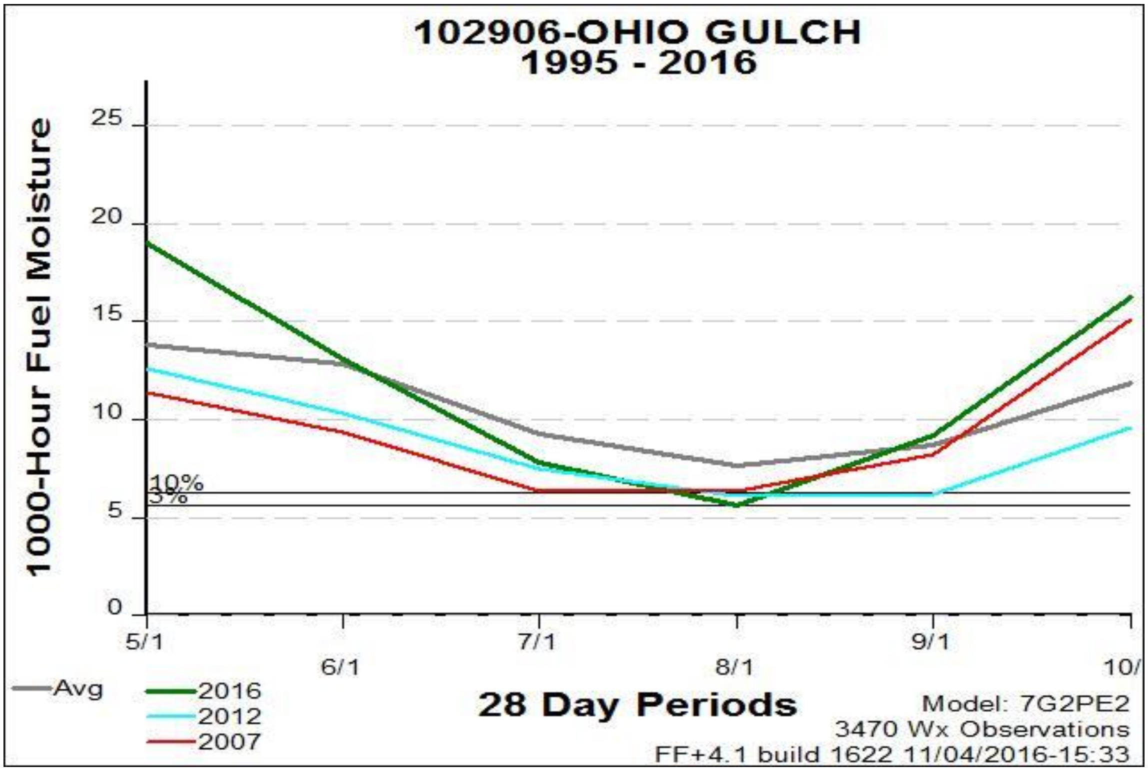


Figure 4.2(c) Observed and average 1000 Hour Fuel Moisture at Ohio Gulch RAWS site, Fire Weather Zone 422.

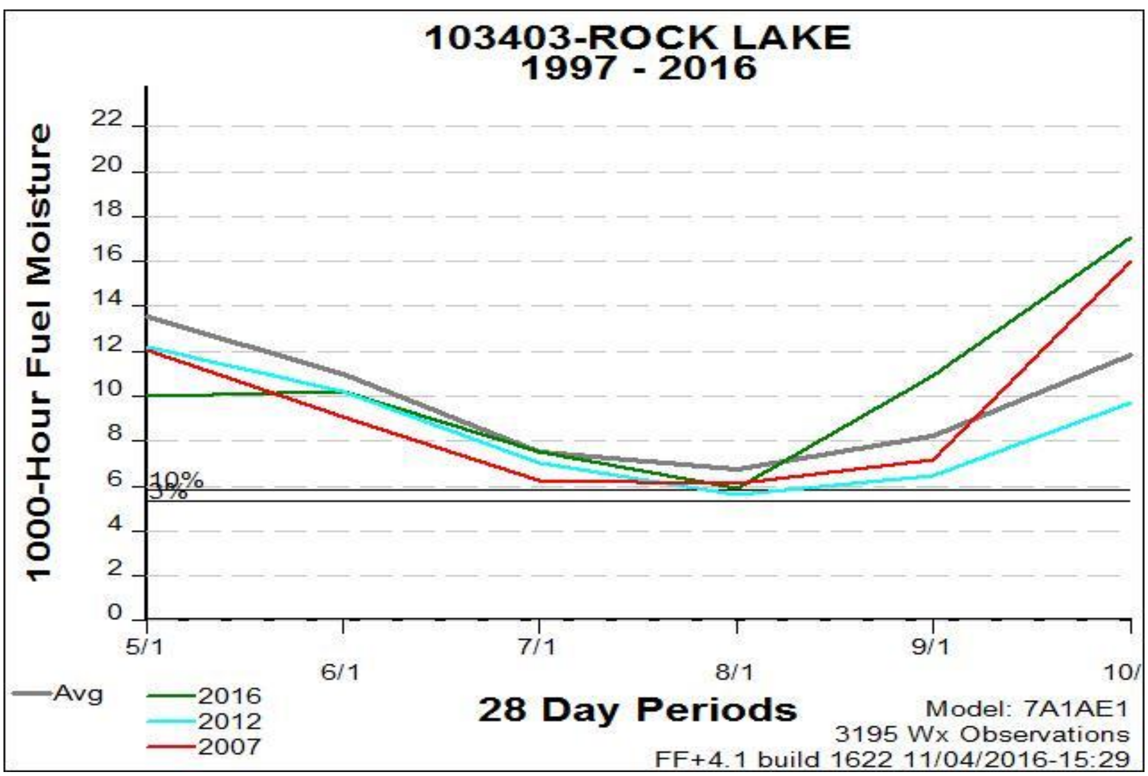


Figure 4.2(d) Observed and average 1000 Hour Fuel Moisture at Rock Lake RAWS site, Fire Weather Zone 425.

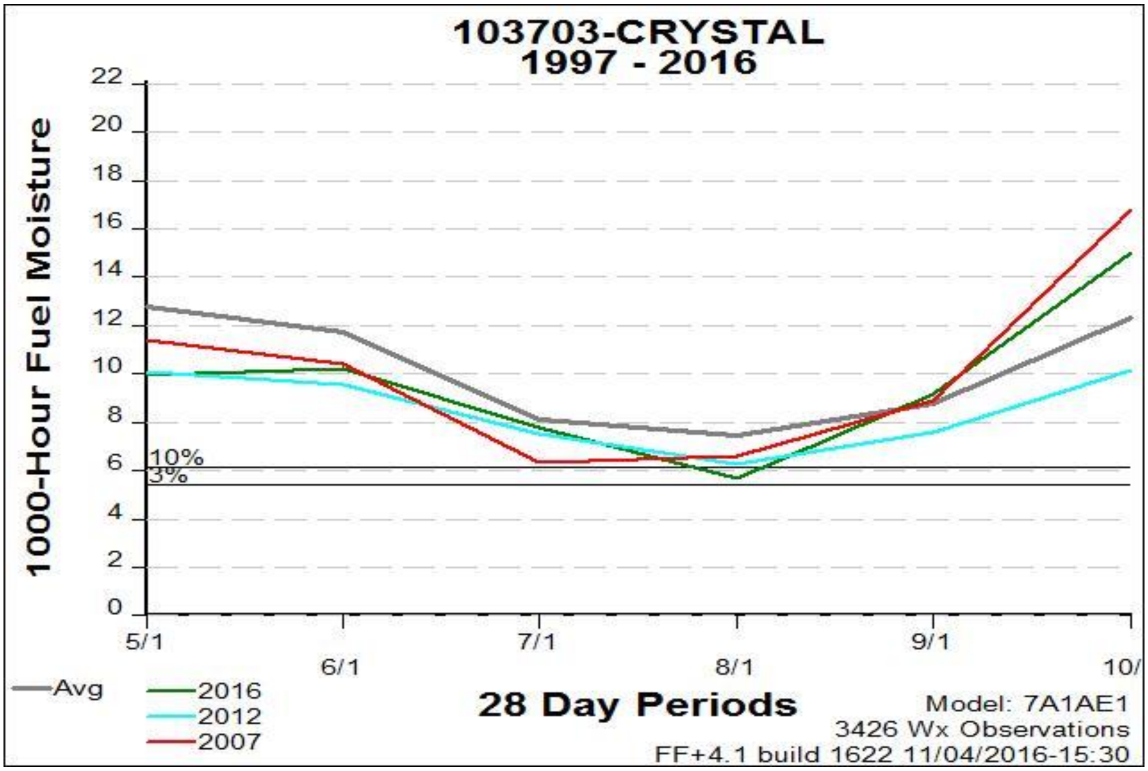


Figure 4.2(e) Observed and average 1000 Hour Fuel Moisture at Crystal RAWS site, Fire Weather Zone 410.

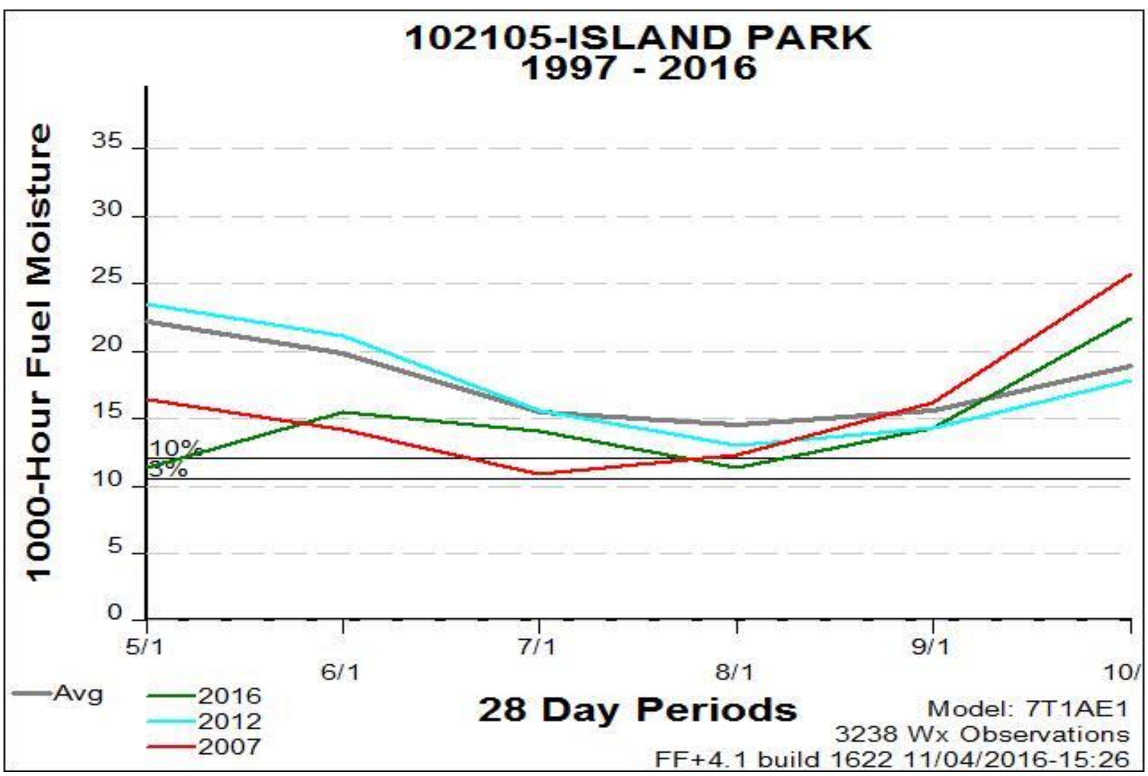


Figure 4.2(f) Observed and average 1000 Hour Fuel Moisture at Island Park RAWS site, Fire Weather Zone 411.

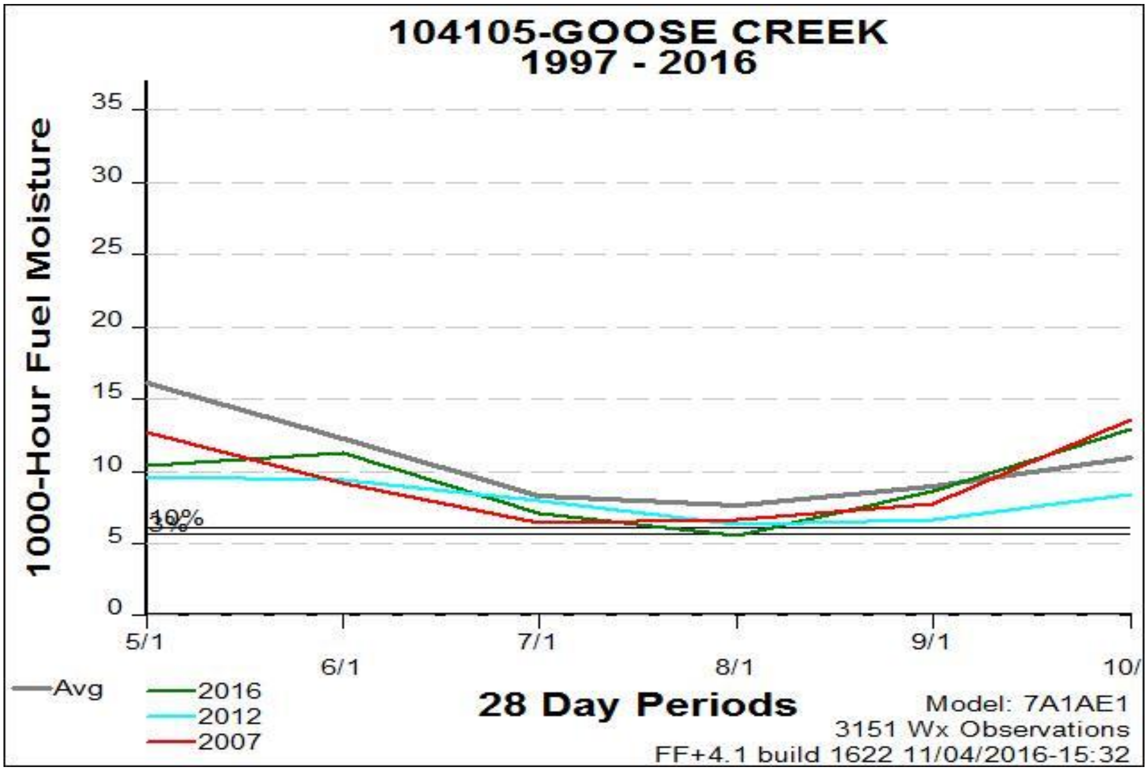


Figure 4.2(g) Observed and average 1000 Hour Fuel Moisture at Goose Creek RAWS site, Fire Weather Zone 427.

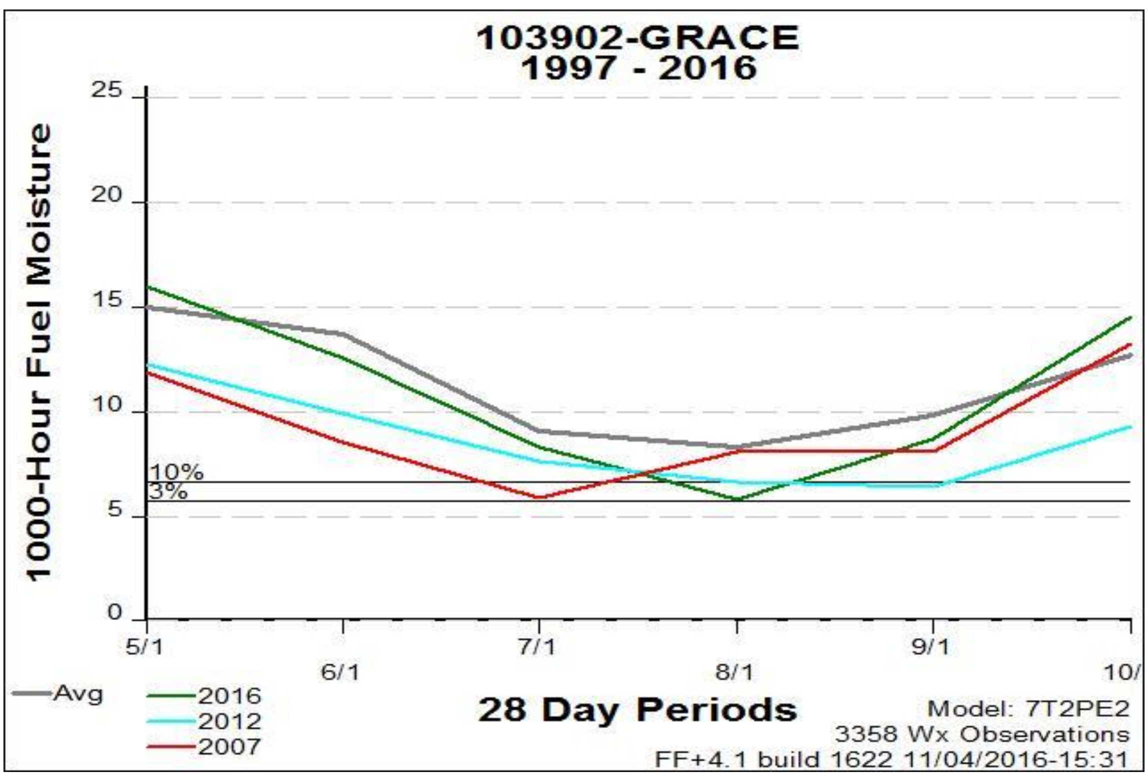


Figure 4.2(h) Observed and average 1000 Hour Fuel Moisture at Grace RAWS site, Fire Weather Zone 413.

5. Office Operations:

5.1 Red Flag Verification

1. Formal verification of Red Flag Warnings in Southeast Idaho began with the 2000 fire season and is now a permanent part of the fire weather program. Verification is based on current Red Flag Warning and Fire Weather Watch criteria that has been coordinated with local land management agencies and published in the Great Basin Annual Operating Plan for Fire Weather and Predictive Services. Current criteria for the Pocatello Fire Weather District are shown in paragraph 5.1.2 below.

Events considered "short fused" or having time lengths typically less than six to twelve hours (Lightning) were split out from other events occurring over a longer time period, reference tables 5.1 (a-d) below.

2. Conditions that indicate a Red Flag Event:

Fire Weather Watches and Red Flag Warnings, are issued for conditions of <u>very high or extreme fire danger</u> (as determined by land management agencies) and <u>dry fuels</u>, in combination with one of the following:

a. Widely scattered or greater ($\geq$ 25% of areal coverage) thunderstorm activity. NOTE: Beginning with the 2014 fire season, the areal coverage requirement for thunderstorms was increased from 15 to 25 percent.

b. Wind gusts for any three or more hours $\geq$ 25 mph for Southeast Idaho Mountains, $\geq$ 30 mph for the Snake River Plain and relative humidity is $\leq$ 15 percent.

c. In the judgment of the forecaster, weather conditions will create a critical fire control situation. These conditions may include strong microburst winds, passage of a cold front or a strong wind shift.

Red Flag criteria are developed from a local knowledge of fuel types, terrain, and weather conditions that are common or unusual to the area, historical fire behavior, and judgment of the local land management agencies. Because the criteria for issuing Red Flag products can vary from one district to another, these verification results are not necessarily comparable with other forecast offices.

3. Methodology:

Verification of Red Flag Warnings was conducted on a zone by zone basis. Example: If a warning for strong wind was issued for fire weather zones 425 and 410, but strong winds were observed only in zone 410, then this counts as two warnings, one that verified and one false alarm. Also, if strong winds were observed in zone 427, but no warning was issued, then this would be counted as one missed event.

Sources of verification included Remote Automated Weather Stations (RAWS), Meteorological Reporting Stations (METAR), lightning data, WSR-88D Doppler Weather Radar estimated precipitation, volunteer weather spotter information such as heavy rain events, and reports of observed fire behavior from personnel in the field.

Local MESONET reporting networks maintained by Idaho Department of Transportation and the Idaho National Laboratory were not used as a source of verification for wind events since there are differences in observing standards at these sites.

Statistical parameters were calculated as follows:

Probability of Detection	POD = a/(a+c)
Critical Success Index	CSI = a/(a+b+c)
False Alarm Rate	FAR = 1-[a/(a+b)]

where

a = the number of correct warnings (verified)
b = the number of incorrect warnings (not verified)
c = the number of events not warned

4. Sources of error:

Red Flag criteria for wind events in the Great Basin were modified based on interagency agreement set forth in the Great Basin Fire Weather Operating Plan for 2005 and continued without change until present. Beginning with the 2008 fire season, the distinction between wet and dry thunderstorms was eliminated from the Red Flag criteria owing to concerns of lightning strikes and fire ignition occurring outside the main thunderstorm rain shaft. A thunderstorm was previously considered “dry” if it produced little or no precipitation (< 0.10 inch). The mid-point of a forecast range serves as the break point for watch/warning issuance. This effectively adds an element of representativeness to the verification process. Therefore, any inference of trends from verification results must consider changes made to the established criteria for a Red Flag Event and verification procedures in past years. The Red Flag Event criteria and verification procedures also changed in 2002, 2004 and 2014. Please reference past issues of this Fire Weather Annual Report.

Forecaster skill level and confidence may be lower for peak wind gusts over sustained wind speed. Downward transport of momentum in the atmosphere, complex terrain, inversions of temperature lapse rate, variations in surface insolation owing to vegetative ground cover, reflectivity, absorption and transmissivity of the atmosphere, and the energy phase change of water in the atmosphere all impact the observed peak surface wind gust. Not all of these processes are sufficiently represented by available computer modeling and operational forecaster techniques.

Personal judgment was required to determine when lightning was more than a widely scattered event and significant in areal coverage.

Field observations of fire behavior may serve as an important indicator of Red Flag conditions. On rare occasion this may affect the best judgment of the forecaster and land management personnel. On days or in locations where there were no on-going fires this information was not available.

In paragraph 2c above, judgment of the forecaster and land management personnel is permitted to override the strict criteria of relative humidity and wind gusts. The general consensus is there is enough uncertainty in the fire environment (fuel, weather and topography) and this should remain a necessary and important element of the Red Flag criteria. This also requires a certain amount of judgment in the verification process.

Both RAWS and METAR stations report instantaneous wind gusts, but the observing standards for height of the wind sensor can vary.

On rare occasion the fuels were defined as critical at an elevation below that of existing RAWS and METAR stations.

Skill and lead-time vary with the type of event.

5. Decision Criteria

Wind – The number of available RAWS and METAR sites varied both with the area warned and location where fuels were defined as critical. Every attempt was made to judge the representativeness of wind conditions.

Lightning – Archived lightning data was used to determine verification. A good deal of judgment was needed to determine if the observed lightning was more than an isolated event. Some thunderstorms are more efficient lightning producers than others.

Wet versus dry thunderstorms – this element was removed from the Red Flag Criteria beginning with the 2008 fire season. The number of reported fire starts is not a reliable indicator since lightning strikes can occur outside the thunderstorm precipitation shield striking drier fuels and a single thunderstorm can be long lived producing numerous strikes over some distance.

Other – Reports of observed fire behavior from personnel in the field continue to be useful when dealing with long-term drought conditions and days of reported low relative humidity. If sustained fire runs are observed but available observations do not necessarily support warning criteria, the judgment would likely fall on the side of safety of life and property.

6. Results:

Red Flag Warning criteria were met on a total of 22 different days during this fire season in the Pocatello Fire Weather District. Strong gusty winds and low relative humidity were a factor on 16 of these days; thunderstorms and lightning activity were a significant factor on 6 of these days. There were 8 events (zones) occurring on 6 different days when Red Flag Warning criteria were met without a warning in effect.

	May	June	July	August	September	October	Total
Total # watches	0	0	18	16	3	0	37
Total # of warnings	0	0	28	37	17	0	82
Number warnings that were preceded by a watch	0	0	18	16	3	0	37
Warnings verified (a)	0	0	22	30	12	0	64
Warnings not verified (b)	0	0	6	7	5	0	18
Events not warned (c)	0	0	3	5	0	0	8

Table 5.1(a). Combined synoptic (long term) and short fused Red Flag event products issued in the WFO Pocatello Fire Weather District during the 2016 season.

	May	June	July	August	September	October	Total
Total # watches	0	0	12	15	3	0	30
Total # of warnings	0	0	22	24	17	0	63
Number warnings preceded by a watch	0	0	12	15	3	0	30
Warnings verified (a)	0	0	18	20	12	0	50
Warnings not verified (b)	0	0	4	4	5	0	13
Events not warned (c)	0	0	3	3	0	0	6

Table 5.1(b). Synoptic scale Red Flag event products issued in the WFO Pocatello Fire Weather District during the 2016 season. Example cold fronts, low relative humidity, strong pressure gradient related winds.

	May	June	July	August	September	October	Total
Total # of watches	0	0	6	1	0	0	7
Total # of warnings	0	0	6	13	0	0	19
Number warnings preceded by a watch	0	0	6	1	0	0	7
Warnings verified (a)	0	0	4	10	0	0	14
Warnings not verified (b)	0	0	2	3	0	0	5
Events not warned (c)	0	0	0	2	0	0	2

Table 5.1(c). Short fused Red Flag event products issued in the WFO Pocatello Fire Weather District during the 2016 season. Example: lightning events and strong microburst winds.

Red Flag verification resulted in the following:

	Synoptic Events	Short Fused Events (Lightning)	All Events	3 year average
Probability of detection POD	0.89	0.88	0.89	0.91
Critical success index CSI	0.72	0.67	0.71	0.69
False alarm rate FAR	0.21	0.26	0.22	0.26
Average lead time for Watches			31 hrs. 41 min	32 hrs. 57 min
Average lead time for Warnings	16 hrs. 50 min.	14 hrs. 03 min.	16 hrs. 13 min	14 hrs. 40 min

Table 5.1(d). Combined synoptic (long term) and short fused Red Flag event products issued in the WFO Pocatello Fire Weather District during the 2016 season.

7. Implications:

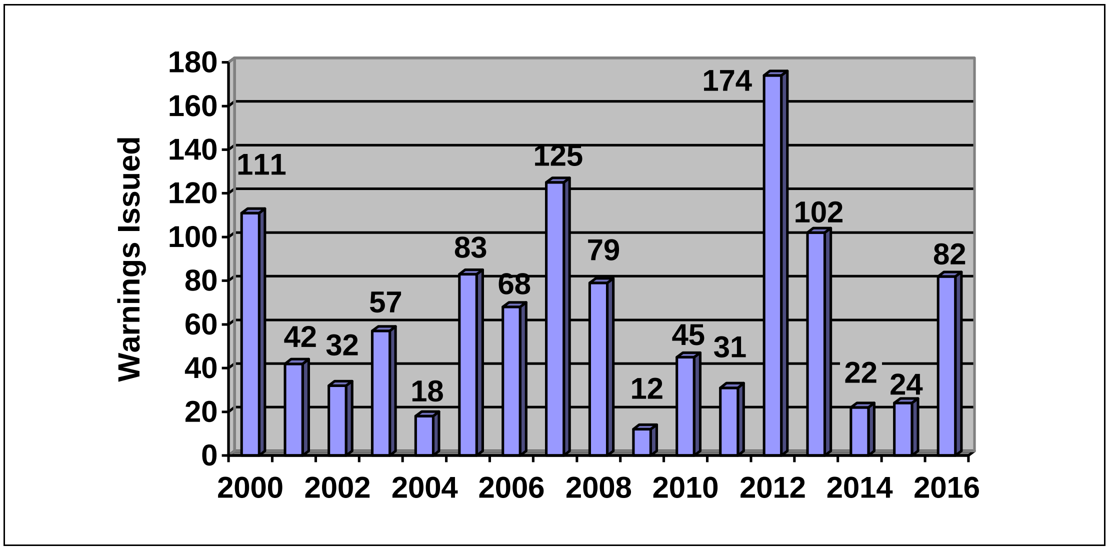


Figure 5.2 Historical Red Flag Warnings in Southeast Idaho; based on one warning per fire weather zone meeting criteria. In dry years the number of zones with "critical" fuels generally increases, and so does the number of warnings. The Red Flag criteria have changed several times since the 2000 fire season and are not necessarily comparable.

The 2016 fire season in Southeast Idaho was characterized by persistent westerly winds off the Pacific Ocean, with numerous embedded disturbances that produced days with low relative humidity and strong and gusty surface winds. This pattern substantially limited the number of days when very moist and unstable air associated with the Southwest Monsoon winds was able to advance north into Idaho.

5.2 Spot Forecasts and briefings prepared by WFO Pocatello:

Wildfires	165	Verbal Phone Briefings	48
Prescribed Fires	171	For fire support	02
HAZMAT	1	Search & Rescue/HAZMAT	03
Backup	0	Emergency management	02
Exercise	0	Recorded Briefings	317
Search & Rescue	4	Total	372
Total	341		

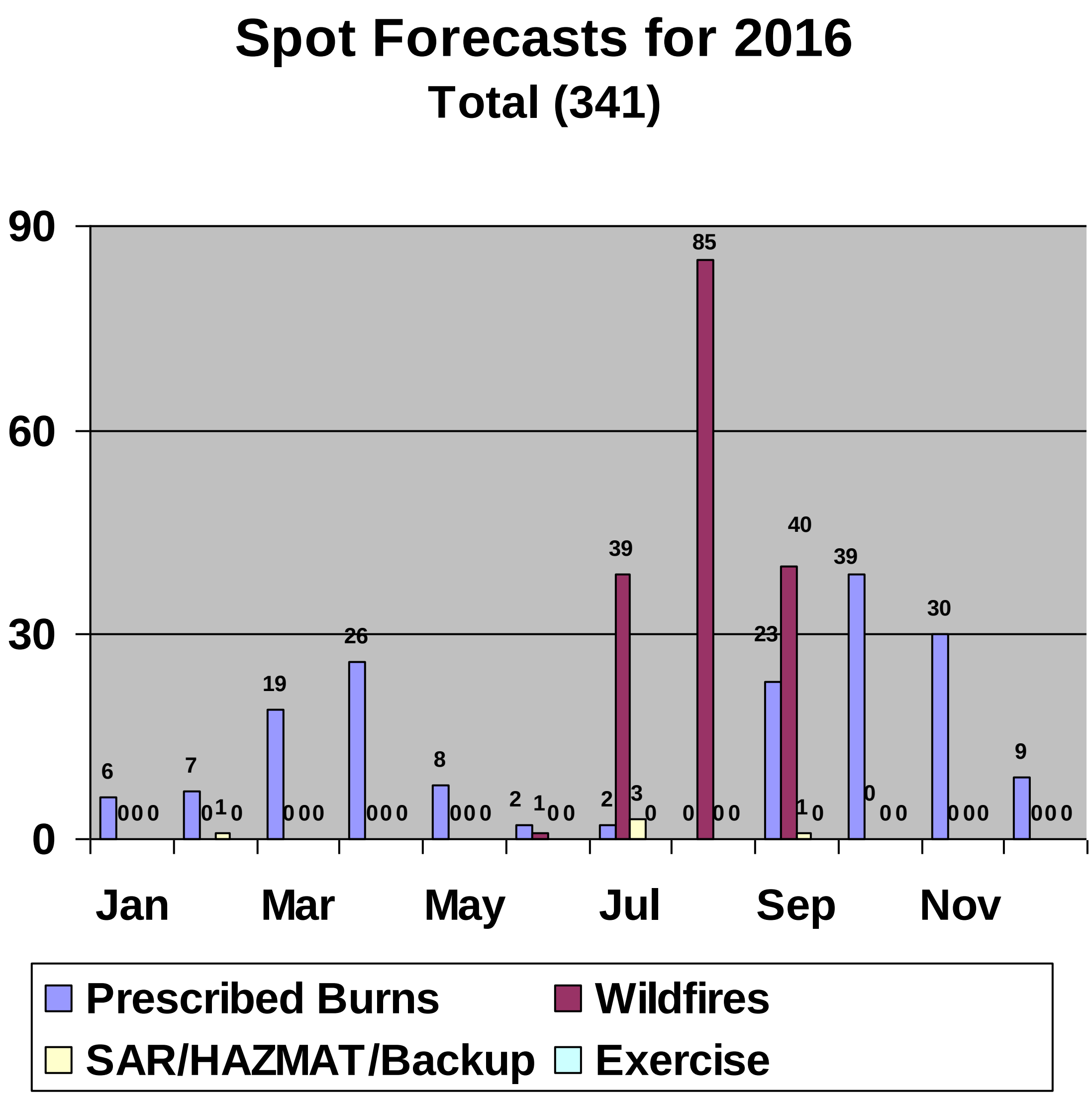


Figure 5.3(a) Spot Forecasts prepared by the Pocatello Fire Weather District during the 2016 fire season.

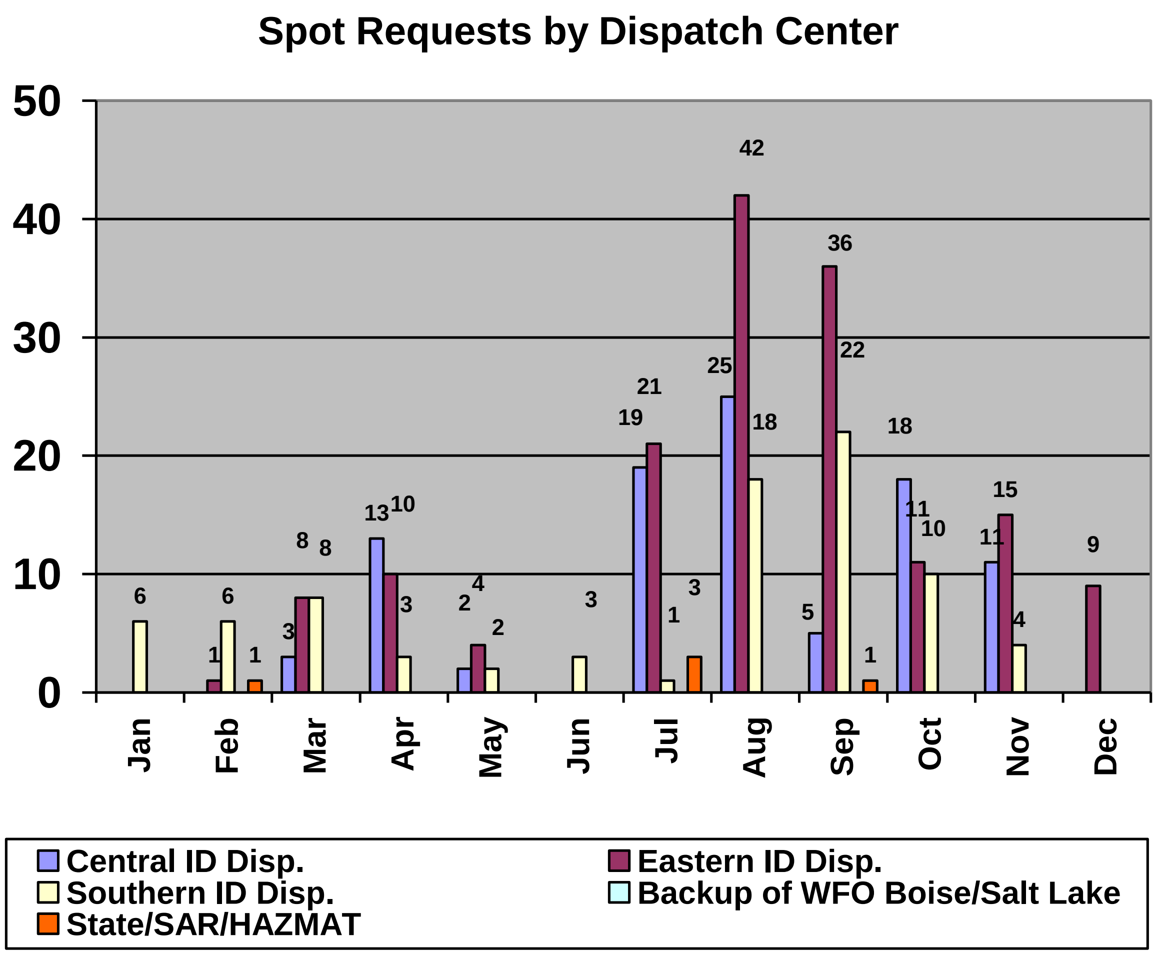


Figure 5.3(b) Spot Forecasts requested by dispatch area during the 2016 fire season in Southeast Idaho.

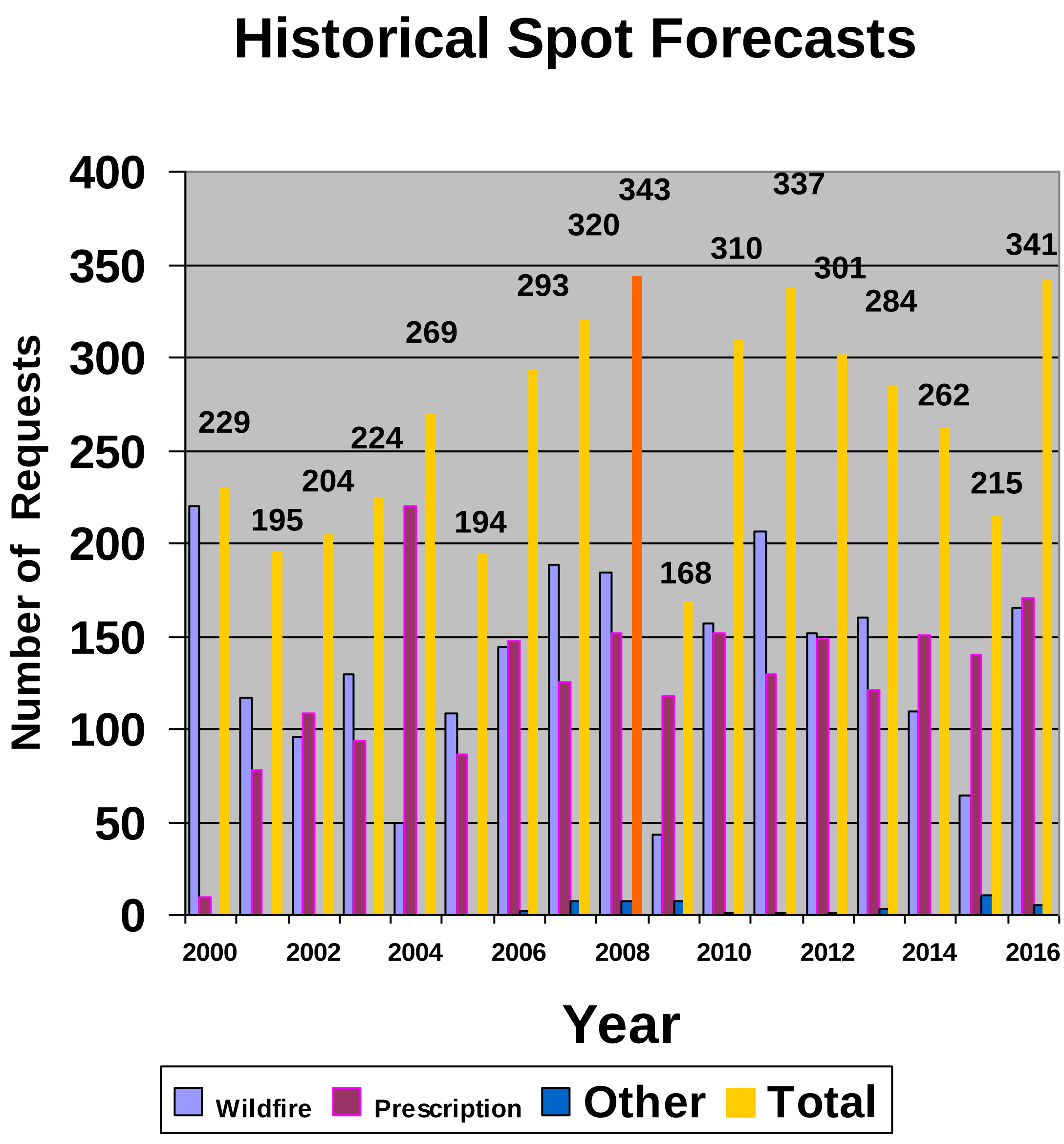


Figure 5.4 Historical trends in Spot Forecast requests for the Pocatello Fire Weather District. There were 341 SPOT forecasts provided in 2016. The record for the National Weather Service Office in Pocatello is 343 SPOT forecasts in 2008.

5.3 Fire Dispatches Supported by WFO Pocatello: There were three Type I IMET dispatches this fire season resulting in 11 man days served out of the office.

Date	*Dispatch Location*	*Type I Incident Meteorologist*
August 03 to August 13, 2016	Copper King Wildfire Lolo NF near Thompson Falls, Montana	Jack Messick
August 20 to August 24, 2016	Stein Wildfire Salmon NF Near Salmon, Idaho	Jack Messick
August 25 to August 31, 2016	Cayuse Mountain Fire Near Wellpinit, Washington	Jack Messick

Table 5.3a Type I Incident Meteorologist Dispatches by WFO Pocatello (in support of onsite IMT operations).

Date	*Dispatch Location*	*Type II Incident Meteorologist*
February 17, 2016	Teton County Winter Table Top Exercise, Driggs, ID.	Vern Preston Travis Wyatt Nicole Peterson Bob Survick
Febuary 17, 2016	Cold and Chemical Exercise, Twin Falls, Id.	Dan Valle Alex DeSmet
May 24-26, 2016	EOC Emergency Operations and Planning for All Hazards, Idaho State University.	Dean Hazen Vern Preston Corey Loveland Kurt Buffalo John Keyes
July 20, 2016	Montpelier Hazards Meeting, Oregon Trail Center.	Vern Preston
July 27-29, 2016	DSS Driggs and ISU, Idaho Shakespeare Festival	Staff
July 28, 2016	Pioneer EAP Tabletop Exercise, Ogden, UT.	Corey Loveland
August 31 to September 11, 2016	Eastern Idaho State Fair, Blackfoot, Idaho Daily Decision Support	Various staff
Sept. 7, 2016	Pioneer EAP Functional Exercise, Ogden, UT.	Corey Loveland and John Hinsberger
Sept 22, 2016	Grassy Lake Dam Exercise	Staff
Sept 22, 2016	Island Park Dam Exercise	Staff
Sept 22, 2016	Palisades Dam Exercise	Staff

Table 5.3b Type II Incident Meteorologist Dispatches or local support by WFO Pocatello (at an Emergency Operations Center, Area Command, or Joint Field Office location).

5.4 Training: WFO Pocatello staff participated in the following training courses during the 2016 season.

Forecaster	Training situation
Jack Messick	IMET Continuity of Excellence Exercise, Virtual Training, Boise, Idaho, March 9, 2016.
Jack Messick	Fire Talks, Chubbuck and Swan Valley, Idaho, May 18, 2016.
Mike Huston	Sawtooth Fire Weather Training, Ketchum, Idaho, May 20, 2016.
Jack Messick	Instructor S-290 Intermediate Wildland Fire Behavior, Salmon-Challis National Forest, Challis, Idaho, June 6-7, 2016.
Mike Huston	Instructor S-290 Intermediate Wildland Fire Behavior, Caribou-Targhee National Forest, Eastern Idaho Technical College, Idaho Falls, Idaho June 7-8, 2016.
Bob Survick	Pre-Fire Season Station Meeting for all forecasters, National Weather Service Office, Pocatello, Idaho April 14, 2016.
Jack Messick	RT-130 Annual Fireline Safety Refresher Training, April 21, 2016.
Bob Survick	Fire on the Five's Webinar, New SPOT Software, August 15, 2016.
Bob Survick Dawn Harmon Alex Desmet	Completed ICS-400, Advanced ICS, Southeast Idaho Health District, May 10-11, 2016
Various staff	NWS Pocatello DSS Roadshow Training, September 27-28, 2016.
Mike Huston Jack Messick	Completed ICS-400, Advanced ICS, Idaho Falls, October 5-6, 2016.

5.5 Field Visits: The staff at WFO Pocatello participated in 38 interagency meetings this year.

Location	Dates
Gate City Interagency Fire Front Meetings, Pocatello, Idaho	Monthly
Local Emergency Planning Committee Hydrology and Fire Weather Outlook Various Counties and dates Vern Preston, Corey Loveland	9 meetings
Ground Hog Day Chili Cook-off Southeastern District Health Office Pocatello, Idaho	January 29, 2016
Sawtooth NF Avalanche Cent. Travis Wyatt, Kurt Buffalo Dawn Harmon, Greg Kaiser	February 18-19, 2016
Great Basin Predictive Services, And National Weather Service Annual Operating Plan Meeting, Via Conference Call Bob Survick	March 23, 2016
FMO and Dispatch Meeting Eastern Idaho Interagency Fire Center Idaho Falls, Idaho Dean Hazen, Kurt Buffalo, Mike Huston, Bob Survick	April 20, 2016
Idaho Fire Chief Meeting Sun Valley, Idaho Vern Preston	April 22, 2016
USBOR Spring Planning Meeting Heyburn, Idaho Corey Loveland, Vern Preston, Kurt Buffalo	April 27, 2016
Community Fire Meeting North Fork, Idaho Dean Hazen and Kurt Buffalo	June 9-10, 2016

Pre-Season Meeting June 21-22, 2016
Central Idaho Interagency Fire Center
Salmon, Idaho
Dean Hazen, Mike Huston, and Bob Survick,
And Kurt Buffalo

Avalanche Meeting March 30-31, 2016
Sawtooth Avalanche Center
Sun Valley, Idaho
Travis Wyatt

Spring Cooperators Meeting April 19, 2016
South Central Idaho Interagency
Dispatch Center
Shoshone, Idaho
Dean Hazen, Mike Huston, Bob Survick,
And Kurt Buffalo

Spring Operations Meeting May 19, 2016
Eastern Idaho Interagency Fire Center
Idaho Falls, Idaho
Bob Survick

5.6 Support to Type I IMETs dispatched to the WFO Pocatello area of responsibility:

Bob Hoenisch, Great Falls, MT assigned to the Henry's Creek Wildfire Idaho Falls, Idaho from August 24 through August 31, 2016.

Alex Hoon, Reno, NV assigned to the Tie Fire near Victor, Idaho from August 25 through September 5, 2016.

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